This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

NOT TO BE TAKEN
FROM
THE LIBRARY.

NAC
2
M92q
v.46

HARVARD UNIVERSITY

Library

OF

The School of
Landscape Architecture

HARVARD UNIVERSITY

Graduate School of Landscape Architecture [illegible]

June 1920

2321

NAC

MUNICIPAL JOURNAL & PUBLIC WORKS

INDEX

VOLUME XLVI

JANUARY TO JUNE

1919

MUNICIPAL JOURNAL AND ENGINEER
(INCORPORATED)
243 WEST 39TH STREET
NEW YORK

MUNICIPAL JOURNAL & PUBLIC WORKS

INDEX

VOLUME XLVI

JANUARY—JUNE

1919

General Index

Acid Treatment of Sewage.....365
Activated Sludge, Mechanical Agitation for 349
Sludge Without Compressed Air..356
Air-Lift Artesian Well.....249
Air Patrolmen 319
American Methods and Machinery Applicable to Construction and Maintenance of French Highways 23
Water Works Convention....446, 468
Anaheim's Sprinkler Truck.....230
Analyses, Making Water: Waterworks Operation 131, 179
Annual Statistical Number, Our.....397
Anopheles Elimination, A Problem in.353
Appliances, Waterworks Office.....422
Army, Garbage Utilization by the....319
Army's Utilization of Camp Wastes, The 304
Assessing Paving Costs.....161
Assessments for Street Improvements.151
Asphalt, Parking Automobiles Ruins.353
Austin, Street Lighting in.....368
Automobiles Ruins Asphalt, Parking.353

Baltimore's Boundary, Survey of.... 32
Garbage to Pigs, Feeding.....220
Backwardness in Road Improvement.361
Billings Waterworks Notes..... 32
Binghamton Sand Catcher..... 191
Bitumen Extractor, Steam Heated....130
Blacksmith Shop, Small Municipal...436
Block Pavements at Lakewood, Wood.162
Blow-Off, A Siphon Reservoir..... 83
Blue Print Plant, Municipal Photograph and 312
Bonds, Municipal 33, 259, 333
,State Roads without.....319
Boulder's Budget 34
Boundary, Survey of Baltimore's.... 32
Brick Pavements 340
Paving, Developments in.....294
Bridge, An Unusual Concrete Highway 368
Bridgeport, Sewage Treatment at....363
Bridges and Heavy Trucks, Highway.279
,But How About the.....275
,Cost of Concrete.....353
,Pennsylvania Highway 387
Safe, Are Our Highway.....276
Budget, Boulder's 34
Buried Streets of San Francisco.....253
Buying for Municipalities, Centralized 222

Calcium Chloride in Connecticut.....386
Camp Wastes, The Army's Utilization of 304, 322
Catcher, Binghamton Sand.....191
Censored, Technical Articles.....109
Central Stations, Coal Consumption in 177
Chlorination in Michigan.....403
of Sewage 266
Chlorine Doses, Regulating.....264
Cities Clean? Are Our.....207
,Statistics from 148
City Maps 387
Scavenging, Efficiency in.....309
Clean? Are Our Cities.....207
Cleaning Methods, Street.....101, 125
Report for Rochester, Street..... 41
Coagulant, Work as a.....133
Coal Consumption in Central Stations.177
Coats for Rodmen, Red.....436
Code Letters as Highway Reports....230
Cold Weather, Concreting in..... 7
Weather and Mains in Duluth.... 6
Columbus Board of Purchase.....311
Reduction Plant, The.....369
,Sewage Disposal at.....337
,Street Lights in.....264
Waterworks in 1918.....221
Community Heating of Dwellings....249
Compressed Air, Activated Sludge without 356
Concrete Pavement Construction, Suggestions for 434, 467
Pavement with Dynamite, Breaking Up 191
Roads, Stresses in.....466
Concreting in Cold Weather..... 7
Connecticut, Calcium Chloride in.....386
Construction Prospect, The.....228
Contractors, Cost Keeping for Highway 236
Contractors' Point of View, The Manufacturers' and 149
Control or What? Public Ownership, Public 9
Convention, American Water Works, 446, 468
Cost Keeping for Highway Contractors 236
of Concrete Bridges.....353
Costs, Keeping Truck.....328
and Contracts, Garbage Disposal.223
Craddock, Housing Construction at.. 61
Creamery Wastes, Treatment and Disposal of 67
Creek Banks for Incinerator Refuse..208
Crematory with Self-Respect, A Garbage 204
Crushed Stone, Use of..... 45
Cuts, Construction of Highways in...282

Dam, New Brunswick's New.....308
Data, Tabulated Highway.....283
,Water Meter 407
Day Labor on a Large Scale.....303
Daytona Sewers and Waterworks....180
Detroit, Home Buying in.....384
,Water Consumption in.....218
Waterworks, Report on.....334
Disinfection in Maryland, Progress of Water 405
Disinfection of Water Supplies...402, 437
Disposal at Columbus, Sewage.....337
Costs and Contracts, Garbage....223
in London, Refuse.....263
Disposal in New York, Garbage..... 8
Drains in Sewer Construction.....267
Duluth, Cold Weather and Mains in.. 6
Duplicate Street Names, Avoiding....308
Dwellings, Community Heating of....249
Dynamite, Breaking Up Concrete Pavement with 191

Electric and Steam Pumping Plants..181
Department, McPherson's 387
Electricity, Heating by.....107
El Paso, Deep Well Pumps in.....308
Engineer in Politics, The.....388
Engineering Services, To Those Desiring 109
Engineers' Salaries, Proposed Schedule of 389
Expenditures, Municipal Revenues and 48
Experiment Stations, Obtaining Sewage for 231
Extractor, Steam Heated Bitumen....130

Federal Aid Road Work.....433
Aid Road Act Regulations.....383
Fences, Snow 282
Filter Flies, Sprinkling.....196
Plant, Operation of Louisville....362
Filtration, Insect Aid to.....383
Financing Highway Improvements...296
Fire Protection, Private.....449
Flies, Sprinkling Filter.....196
Flood Control Works, Miami.....341
Florida Lighting and Power Stations.179
Flush Tank, Testing a New.....247
Flushing, A Study of Street.....187
Foundations, Pavement..... 91
Free Public Utilities.....245
Freight Rates on Sand and Gravel....176
French Highways, American Methods and Machinery Applicable to Construction and Maintenance of 23
French Roads and the War..... 67
Roads, Some Lessons from.....176

Garage and Shop, Oakland Municipal.260
Garbage Crematory with Self-Respect, A 204
Disposal Costs and Contracts....223
Disposal in New York..... 8
,Municipal Powers as to.....382
to Pigs, Feeding Baltimore's.....220
Utilization by the Army.....319
,Wrapping 236
Government Machinery for State Highways 338
Grand Haven's Municipal Utilities....228
Gravel, Freight Rates on Sand and...176
Guarantees for Pavements.....193
for Paving 205
,Paving 195, 349, 355
The Question of.....207

Hay-Tar Roads in Wisconsin.....297
Health Report, Texas Board of.....225
Heating of Dwellings, Community....249
by Electricity 107
Heavy Traffic, Effects of.....154
Hetch Hetchy Records, The.....205
High Pressure Fire Service, San Francisco's 454
Highway, A High-Cost.....353
Data, Tabulated 283
Improvements, Financing 296
Reports, Code Letters as.....230
Signs, Uniform 228
Work Contemplated for 1919.....281
Highways, American Methods and Machinery Applicable to Construction and Maintenance of French 23
Highways, Government Machinery for State 338
in Cuts, Construction of 282
,Labor for Soldiers on State..... 72
Hillside Streets, Improving.....150
Hog Feeding in Spokane.....354
Home Buying in Detroit.....384
Housing Construction at Craddock.... 61

Illinois Concrete Roads, Lime for....356
State Highway Department.....468
Immunity from Typhoid, Protection and 397
Incinerator Refuse, Creek Banks for.208
Index of Gate Valves, Card..... 265
Insect Aid to Filtration.....383

Jobs as Well as Honors, Give Them..227

Labor Available for Road Work.....181
Conditions in the United States 209, 224
on a Large Scale, Day.....303
Laconia, Snow Rolling in.....108
Lakewood, Wood Block Pavements at.162
Lancaster's Remodeled Pumping Plant 173
Leominster, Mass., Sewerage of.....232
Lighting and Power Stations, Florida.179
in Austin, Street.....368
Plants, Power for Municipal.....181
,South Norwalk's New Street.....320
Lights in Columbus, Street.....264
Lime for Illinois Concrete Roads.....356
London, Refuse Disposal in.....263
Long Beach Municipal Markets..... 90
Los Angeles Sewerage.....246
Louisville Filter Plant, Operation of..362
Louisville's New Pumping Station...398

McPherson's Electric Department....387
Machinery for State Highways, Government 338
Main Cleaning in St. Louis, Water... 5
Mains in Duluth, Cold Weather and... 6

Manufacturers' and the Contractors' Point of View, The.....149
Maps, City 387
Markets, Long Beach Municipal..... 90
Maryland, Progress of Water Disinfection in.....405
Materials, Prices of Paving and Paving 326
Memorials, Soldiers' 51
Meter Data, Water.....407
Metering Private Sprinkler Systems..369
Meters, Sizes of Service..... 4
Miami Flood Control Works.....341
Michigan, Chlorination in.....403
Mosquito Extermination as an Investment 349
Municipal Aid for Private Plumbing..246
Blacksmith Shop, Small.....436
Lighting Plants, Power for.....181
Ownership of Water Works.....445
Ownership Sometimes Fails, Why. 71
Peace Readjustment 63
Photograph and Blue Print Plant.312
Powers as to Garbage.....382
Revenue and Real Estate Taxes..195
Revenues, Increasing 109, 127
Municipalities, Centralized Buying for 222

National Roads 293
New Brunswick's New Dam.....308
New York, Garbage Disposal in..... 8
,Sewage Screening Plant in...123, 180
,Sewage Treatment in.....133
Newton, Set-Back Lines in.....253
Sewerage Notes 266
Notices Painted on Sidewalk.....267

Oakland, Dumping Refuse at.....312
Municipal Garage and Shop.....260
Office Appliances, Waterworks.....422
Oil Construction for the Streets.....380
Okmulgee's Water Supply and Sewerage 338
Openings in Pennsylvania State Roads 224
,Repairing Pavement 215
Outlook for 1919, The Paving.....143
"Own-Your-Own-Home" Campaign ..333
Ownership or Control of Utilities....370
,Public Control, or What, Public. 9
,Sometimes Fails, Why Municipal 71

Parking Automobiles Ruins Asphalt..353
Patent Settlement, Septic Tank.....379
Pave or Not to Pave, To.....161
Pavement Construction, Suggestions for Concrete 484, 467
Foundations 91
Guarantees 195, 349, 355
Openings, Repairing 215
with Dynamite, Breaking Up Concrete 191
Pavements at Lakewood, Wood Block..162
,Brick 340
,Guarantees for 193
Paving in San Francisco, Street....1, 47
in Winnetka 65
Outlook for 1919, The.....143
Specifications, Rochester's Sewer and 84
Statistics of Cities.....182
Peace Readjustment, Municipal..... 63
Pennsylvania Highway Bridges.....387
State Roads, No Openings in.....224
Traction Engine Regulations.....364
Photograph and Blue Print Plant, Municipal 312
Photography, Public Works..... 34
Pigs, Feeding Baltimore's Garbage to.220
Plumbing, Municipal Aid for Private..246
Politics, The Engineer in.....388
Portable Pumping Apparatus.....121
Portsmouth Waterworks 46
Power for Municipal Lighting Plants.181
Stations, Florida Lighting and...179
Prices of Paving and Paving Materials 326
Private Sprinkler Systems, Metering.369
Providence Water Supply, Improving.350
Public Ownership of Public Utilities..361
Ownership, Public Control, or What? 9
Works, Conference on National Department of 329
Pumping Apparatus, Portable.....121
Plant, Lancaster's Remodeled....173
Plants, Electric and Steam.....181
Station, Louisville's New.....398
Pumps at El Paso, Deep Well.....308
Purchase, Columbus Board of.....311
Purification, Expert Supervision of.. 33

Rainfall Records, Use of.....201
Readjustment, Municipal Peace..... 63
Reclamation, National Waste..... 45
Record, Use of Rainfall.....201
Red Coats for Rodmen.....436
Reduction Plant, The Columbus.....369
Refuse at Oakland, Dumping.....312
Collection in Rochester.....464
Collection, Planning 304
,Creek Banks for Incinerator.....208
Disposal in London.....263
Disposal in Savannah, Street Cleaning and 44
Disposal in Winnetka..... 90
Returns from 259
Regulations, Federal Aid Road Act..385
Repairing Pavement Openings.....215
Reports, Waste Paper.....228
Reservoir Blow-Off, A Siphon..... 83
Maintenance: Waterworks Operation 10, 49, 65, 86, 105
,Temperature Effects on Concrete.253
Revenue and Real Estate Taxes, Municipal 195
,Increasing Municipal 109, 127
Road Act Regulations, Federal Aid...385
Improvement, Backwardness in..361
Work, Federal Aid.....433
Work, Labor Available for.....181
Work, To Supervise Federal Aid.253
Roads and the War, French..... 67
,Counties May Not Issue Bonds for Dirt 375
,Hundreds of Millions for.....275
in Wisconsin, Hay-Tar.....297
,Lime for Illinois Concrete.....297
National 293
,No Openings in Pennsylvania State 224
Some Lessons from French.....176
Without Bonds, State.....319
Rochester, Refuse Collection in.....464
Rochester, Street Cleaning Report for 41
Rochester's Sewer and Paving Specifications 84
Rodmen, Red Coats for.....436

St. Louis, Water Main Cleaning in... 5
Safe? Are Our Highway Bridges.....275
Salaries, Proposed Schedule of Engineers' 389
San Francisco, Buried Streets of.....253
High Pressure Fire Service.....454
Settling Chamber 192
Sidewalks, Steps Up.....108
,Street Paving in.....1, 47
Sand and Gravel, Freight Rates on..176
Catcher, Binghamton 191
Sandusky Water Purification Plant... 72
Santa Rosa's Sewerage and Water Supply 248
Savannah, Street Cleaning and Refuse Disposal in 44
Savannah's Department of Stables and Shops 3
Scavenging, Efficiency in City.....309
Unsewered Districts 303
Screening Plant, New York Sewage...180
Plant in New York City, Sewage.123
Segregating Traffic 72
Septic Tank Patent Settlement.....379
Set-Back Lines in Newton.....253
Settling Chamber, San Francisco.....192
Sewage, Acid Treatment of.....365
,Chlorination of 266
Disposal at Columbus.....337
for Experiment Stations, Obtaining 231
Screening Plant in New York City 123
Treatment at Bridgeport.....363
Treatment in New York.....133
Treatment, Something New in....379
Sewer and Paving Specifications, Rochester's 84
Construction, Drains in.....267
Sewers and Waterworks, Daytona....180
Sewerage and Water Supply, Santa Rosa's 248
,Los Angeles 246
Notes, Newton 266
of Leominster, Mass.....232
,Okmulgee's Water Supply and..338
Shade Trees in Streets.....432
Shop, Oakland Municipal Garage and.260
,Small Municipal Blacksmith.....436
Signs, Uniform Highway.....228
Siphon Reservoir Blow-Off, A..... 83
Sludge, Mechanical Agitation for Activated 349
without Compressed Air, Activated 356
Snow Fences 282
Rolling in Laconia.....108
Surveys of Watersheds.....234
Soldiers, Our Duty to the Returning— and Ourselves 9
,Provide Work for Returned..... 71
Soldiers' Memorials 51
South Norwalk's New Street Lighting.320
Specifications for Public Works..... 91
Spokane, Hog Feeding in.....354
Sprinkling Systems, Metering Private.369
Truck, Anaheim's 230
Sprinkling Filter Flies.....196
Stables and Shops, Savannah's Department of 3
Stations, Coal Consumption in Central.177
Statistical Number, Our Annual.....397
Statistics from Cities.....148
of Cities, Paving.....182
Steam Pumping Plants, Electric and..181
Steps Up San Francisco Sidewalks....108
Stone, Use of Crushed..... 45
Street Cleaning and Refuse Disposal in Savannah 44
Cleaning Methods 101, 125
Cleaning Report for Rochester... 41
Flushing, A Study of.....187
Improvements, Assessments for..151
Lighting in Austin.....368
Names, Avoiding Duplicate.....308
,What Is a..... 51
Streets, Improving Hillside.....150
of Washington, D. C., The..... 33
,Oil Construction for the..... 32
Stresses in Concrete Roads.....466
Survey of Baltimore's Boundary..... 32

Tabulated Highway Data.....283
Tank, Testing a New Flush.....247
Taxes, Municipal Revenue and Real Estate 195
Taxpayers, Educating the.....333
Technical Articles Censored.....109
Temperature Effects on Concrete Reservoir 253
Texas Board of Health Report.....225
Traction Engine Regulations, Pennsylvania 364
Traffic, Effects of Heavy.....154
,Segregating 72
Transportation of Laborers and Materials, Truck 229
Trees in Streets, Shade.....432
,Preserving Shade 481
,Saving Shade 245
Truck Costs, Keeping.....328
Weights and Sizes, Regulating...275
Trucks, Highway Bridges and Heavy..279
Typhoid Epidemic, Xenia's..... 34
,Protection and Immunity from..397

United States, Labor Conditions in the 209, 224
Utilities, Free Public 245
,Grand Haven's Municipal.....228
,Ownership or Control of.....370
,Public Ownership of Public.....361
Utilization of Camp Wastes, The Army's 322

Valves, Card Index of Gate.....265
Viaduct for Pedestrians, Inclined....238
War and the Water Works, The..451, 472
Washington, D. C., The Streets of.... 33
Waste Paper Reports.....228
Reclamation, National 45
Wastes, Treatment and Disposal of Creamery 68
,The Army's Utilization of Camp 304, 322
Water Analyses, Making.....131
Consumption in Detroit.....215
Disinfection in Maryland, Progress of 405
Main Cleaning in St. Louis..... 5
Meter Data 407
,Public Control of.....431
Purification, Expert Supervision of 33
Purification Plant, Sandusky..... 72
Supplies, Disinfection of.....402, 437
Supply and Sewerage, Okmulgee's..338
Supply, Improving Providence's..350
Supply, Santa Rosa's Sewerage and 248
Watersheds, Maintaining Small.....422
,Snow Surveys of.....234
Water Works Convention, American, ...446, 468
Convention, The 445
Daytona Sewers and.....180
in 1918, Columbus.....221
,Municipal Ownership of.....445
Notes, Billings 32
Office Appliances 422
Operation—Making Water Analyses 179
Operation — Reservoir Maintenance 10, 49, 65, 86 105
,Portsmouth 46
,Report on Detroit.....334
,The War and the.....451, 472
Well, Air-Lift Artesian.....249
Pumps at El Paso, Deep.....308
Winnetka, Paving in..... 65
,Refuse Disposal in..... 90
Wisconsin, Refuse Disposal in.....297
Wood Block Pavements at Lakewood.162
Work as a Coagulant.....133
Works Booming, Public.....303
Wrapping Garbage 236

The Week's News

ROADS AND PAVEMENTS

Albany, N. Y.....110, 2
Baton Rouge, La.....35, 456
Des Moines, Ia. 423
Detroit, Mich. 390
Harrisburg, Pa....164, 254, 371, 390, 456
Houston, Tex.....135
Indianapolis, Ind.....73, 134, 239
Jefferson City, Mo.....13, 423
Lansing, Mich.....110, 313
Milwaukee, Wis.....110
Olympia, Wash.....239
Philadelphia, Pa.....13
Portland, Ore.....164, 313, 371
Porterville, Cal.....73
Providence, R. I.....183
Richmond, Va.....183
Salem, Ore.....13, 92, 165

Salt Lake City, Utah.....92, 423
Springfield, Ill. 254, 371
Trenton, N. J.....92, 239, 456
Washington, D. C....35, 52, 73, 134, 164, 254, 313, 371, 423
Waterloo, Ia.....456

SEWERAGE AND SANITATION

Albany, N. Y..... 92
Billings, Mont.....111
Birmingham, Ala.....372
Brockton, Mass..... 74
Huntington, Pa..... 36
London, England.....135
Los Angeles, Cal..... 36
Madison, Wis.....74, 135, 183
New York, N. Y.....255
Roanoke, Va.....313
Sacramento, Cal.....183
San Francisco, Cal.....93, 110
Toledo, Ohio.....424
Trenton, N. J.....93, 254
Washington, D. C....35, 74, 93, 111, 135, 313, 371, 390
Worcester, Mass.....424

WATER SUPPLY

Altoona, Wis..... 74
Ashland, Ky..... 36
Bayonne, N. J..... 36
Charleston, W. Va.....165
Denver, Colo..... 13
Indianapolis, Ind.....240
Jersey City, N. J.....391, 424
Media, Pa.....135
Middletown, Ohio..... 13
Newport, R. I..... 14
New York, N. Y..... 52
Niagara Falls, N. Y.....255, 425
Omaha, Nebr.....136
Oswego, N. Y.....373
Philadelphia, Pa..... 52
Pueblo, Colo..... 74
Sacramento, Cal.....373, 425
San Francisco, Cal..... 74
Savannah, Ga.....373
Seymour, Ind.....373, 391
Wauseon, Ohio.....136
West Orange, N. J..... 36
Wilmington, N. C.....165, 240

STREET LIGHTING AND POWER

Albany, N. Y.....136, 425
Alliance, Ohio 184
Augusta, Maine.....314
Canton, Ohio.....392
Charleston, Va..... 93
Chicopee, Mass.....184
Columbus, Ohio..... 53
Denison, Tex.....425
Glasgow, Scotland 14
Harrisburg, Pa.....456
Howell, Mich..... 93
Indianapolis, Ind.....165
Lamar, Colo..... 36
Lansing, Mich.....374
Los Angeles, Cal.....94, 111
Madison, Wis.....166
New York, N. Y.....111
Noblesville, Ind.....255
Omaha, Nebr.....240, 392
Osceola, Mo.....457
Ottawa, Canada 240
Richmond, Va.....166
St. Joseph, Mo.....456
Sacramento, Cal.....240
San Francisco, Cal..... 36
Springfield, Ill.....392
Syracuse, N. Y.....314
Toronto, Ont.....14
Washington, D. C.....136, 255, 314, 374
Westfield, Mass..... 53
Woonsocket, R. I..... 53

FIRE AND POLICE

Albany, N. Y.....315, 426
Auburn, N. Y..... 75
Boise, Idaho 241
Boston, Mass.....75, 167, 184, 315
Burlington, N. C..... 15
Charleston, W. Va.....315
Cincinnati, Ohio 315
Cleveland, Ohio 37, 54
Dallas, Tex.....393, 457
Dodge City, Ia.....112
Elmira, N. Y.....457
Harrisburg, Pa.....241
Indianapolis, Ind.....75, 94, 241
New Rochelle, N. Y.....392
New York, N. Y.....15, 37, 95, 112, 167, 184, 315, 392, 426
Philadelphia, Pa..... 53
Pittsburgh, Pa.....54, 112
San Francisco, Cal.....426
Savannah, Ga.....167
Toledo, Ohio..... 94
Trenton, N. J.....37, 137, 314
Waco, Tex.....393
W. Warwick, R. I.....112
Washington, D. C.....15, 94
Yonkers, N. Y..... 14

GOVERNMENT AND FINANCE

Albany, N. Y..16, 54, 95, 112, 138, 393, 425
Alliance, Neb.....457
Boston, Mass..... 75
Boulder, Colo.....316, 425
Bradford, England.....425
Bristol, Va.....315
Brookline, Mass.....242
Chicago, Ill.....168
Columbus, O.....37, 95
Dayton, O.....95, 256
Detroit, Mich.....37, 55
Elizabeth City, N. C.....457
Gastonia, N. C. 457
Hays, Kan.....242
Indianapolis, Ind.....113
Lapeer, Mich 393
Los Angeles, Cal.....184, 256
Muskegon, Mich.....242
New Bedford, Mass.....37
New York, N. Y.....54, 457
Omaha, Nebr.....96
Philadelphia, Pa.....113
Pittsburgh, Pa..... 76
Portland, Ore..... 76
Richmond, Va.....138
St. Louis, Mo.....15, 37
Sacramento, Cal.....15, 16
San Francisco, Cal.....137, 168
Scranton, Pa.....393
Seattle, Wash.....168
Trenton, N. J.....185
Washington, D. C.....15, 241, 242
Woodstock, N. B.....457

TRAFFIC AND TRANSPORTATION

Akron, O.....394
Baltimore, Md..... 76
Boston, Mass..... 55
Buffalo, N. Y.....16, 185, 393
Cedar Rapids, Ia..... 55
Des Moines, Ia.....185
Great Barrington, Mass.....38
Houston, Tex.....139
Indianapolis, Ind..... 55
Milwaukee, Wis.....375
Minneapolis, Minn.....168
New York, N. Y.....76, 168
Pittsburgh, Pa.....457
St. Louis, Mo.....37, 139
Seattle, Wash.....375
Taunton, Mass.....394
Washington, D. C.....16, 457

STREET CLEANING AND REFUSE DISPOSAL

Columbus, O.....138
Indianapolis, Ind..... 96
Philadelphia, Pa..... 17
San Francisco, Cal.....139
Spokane, Wash..... 96
Toledo, O.....17
Washington, D. C.....17, 38

CITY PLANNING AND HOUSING

Bristol, England.....77
New York, N. Y.....77

MISCELLANEOUS

New York, N. Y.....18
Trenton, N. J.....18
Washington, D. C.....426

Legal News

Abutting Owner—Sewer Assessment 169
Acquisition of Land by City—Construction of Street Railroad.....139
Arbitration, Condemnation—Ministerial Functions of Municipal Officers —Legitimate Acts 332
Asphalt by City, Sale of—Price subject of Ordinance.....242
Assembly, Act of General—Unreasonable Exercise of Power.....375
Assessment—Land Used for Educational Purposes.....139
—"Roadway"—Reconstruction of Improved Street 169
for Highway—"Original Construction" 169
on Industrial Property, Street Improvement 169
,Sewer—Abutting Owner.....169
Sewer—Land Already Drained.... 97
Assessments, Irregular—Street Improvements 360
Street—Judicial Status of Council 185
Authority of Engineer—Extra Work Contract 169
Automobile, Death from Police—Liability of City.....332
on Streets, Rights of Pedestrians and 242
Bidder, Lowest—City Contract Specifying Stone Cutting in City.....169
Bond Issue Election, Waterworks—Validity 97
Bond, Recovery by Subcontractor on Principal's. 169
Bonding Company's Liability—Liens—Failure to Complete Contract on Time 97
Bonds, Invalid Issue of—Bonded Indebtedness 242
for Dirt Roads, Counties May Not Issue 375
Bridge on Public Street, Private—Vacation of Street—Review of Ordinance by Court—Wording.....360
Buildings, Power to Remove Unsafe 360
Business in Residence Street, Undertaking—Power of Restriction..... 97
City Contract, Validity of—Knowledge of Council 185
Civil Service—Exempt Firemen—Power of Removal by Mayor.....256
Commission, Power to Create Transit —Initiated Ordinance 18
Compliance—Payment—Garbage Removal Contract 242
Condemnation Arbitration — Ministerial Functions of Municipal Officers —Legitimate Acts 332
Constitutionality — Abandonment of Railway Franchise—Operation at Loss 394
Construction in Favor of Public—Doubtful Municipal Contract..... 18
of School Buildings, Police Power of City to Regulate.....242
"Construction, Original"—Assessment for Highway 169
Continuous Trip—Expired Railway Franchise—Renewed by Ordinance 427
Contract, Doubtful Municipal—Construction in Favor of Public..... 18
Extra Work—Authority of Engineer 169
,Garbage Removal—Compliance —Payment 242
on Time, Failure to Complete—Bonding Company Liability—Liens 97
,Ordinance Becomes—Prohobition of Poles and Wires.....427
,Statutes in Force, Part of.....394
,Validity of City—Knowledge of Council 185
Contracts Specifying Stone Cutting in City, City—Lowest Bidder.....169
Corporations, Political or Quasi—Municipal Corporations—Distinction..375
Council, Judicial Status of—Street Assessments 185
,Knowledge of—Validity of City Contract 185
Counties May Not Issue Bonds for Dirt Roads 375
Courses, Separate Rolling of—Paving Specifications 97
Creek by Gas Company Waste, Pollution of—Prosecution 97
Crossing, Use of Railroad—Public Easement 360
Crutch in Pavement Hole—Liability of City for Damage 316
Damage to Merchandise, Storm Sewer —Negligence of Merchant 360
Damages Caused by Street Grading—Offset by Increased Values.....169
Death from Police Automobile—Liability of City 332
Defective Condition of Street—Liability of City 332
Depression Filled with Water, Street —Liability for Sickness..... 97
Destruction of Property by Police in Abatement of Nuisance.....332
Ditch, Raising Grade of Street Above —City Liable for Flood Damages..242
Dismissal—Insubordination of Employe—Sickness 18
Disqualification, Physical—Retirement of Firemen 374
Easement, Public—Use of Railroad Crossing 360
Educational Purposes, Land Used for —Assessment 139
Egress from Private Property—Obstruction by Railroad 316
Employe, Insubordination of—Sickness—Dismissal 18
Engineer, Authority of—Extra Work Contract 169
Examination, Venereal Disease—Legality of Requirement 394
Exempt Firemen—Power of Removal by Mayor—Civil Service 256
Exemption from Taxation—Power of City to Encourage Factories.....360
Factories, Power of City to Encourage —Exemption from Taxation.....360
Fire Apparatus, Speed Limits for—Responsibility of Commissioner....360
Limits, Power of Village Trustees to Establish 256
Firemen, Exempt—Power of Removal by Mayor—Civil Service.....256
,Retirement of—Physical Disqualification 375
Flood Damages, City Liable for—Raising Grade of Street Above Ditch 242

Franchise, Abandonment of Railway —Operation at Loss—Constitutionality 394
,Expired Railway—Renewed by Ordinance—Continuous Trip...427
Expires, Compelling Track Removal When 360
for Water and Light Company, Validity of 360

Garbage Removal Contract—Compliance—Payment 242
Gas Company Waste, Pollution of Creek by—Prosecution.... 67
Grade of Street Above Ditch, Raising —City Liable for Flood Damages..242
,Sidewalks on Steep—Liability of City 332
Grading, Damages Caused by Street—Offset by Increased Values....169
Guards, City Payment for Railroad Crossing—Police Power.... 97

Highway, Assessment for—"Original Construction" 169
,Public — Continuous Use of Street 360
Highways, City Must Protect—Liability for Injury 332
Hog Found Near Residence, Town...360
Hospital, Injury of Patient in City—Negligence of Nurse—Liability....360

Ice on Sidewalk—Liability of City...332
Plant, Power to Build—Limiting Municipal Functions 375
Incorporated, Mill Constructed Before Town—Power to Regulate 97
Indebtedness Beyond Limit—Enforceable Contract for Purchase of Waterworks 139
,Bonded—Invalid Issue of Bonds.242
Industrial Property, Street Improvement Assessment on....169
Injuries, Liability for — Unopened Streets 169
Injury, Liability for—City Must Protect Highways 332
of Patient in City Hospital—Negligence of Nurse—Liability....360
Insubordination of Employe—Sickness —Dismissal 18

Lamp Size Reduction—Street Lighting Contract 97
Land by City, Acquisition of—Construction of Street Railroad....139
Used for Education Purposes—Assessment 139
Legality of Requirement—Venereal Disease Examination....394
Legislature, Taxing Power and Contracts Modified by 394
Legitimate Acts—Condemnation Arbitration—Ministerial Functions of Municipal Officers 332
Liability, Bonding Company—Liens—Failure to Complete Contract on Time 97
for Injuries, City — Unopened Street 169
for Sickness—Street Depression Filled with Water.... 97
of City—Death from Police Automobile 332
—Defective Condition of Street.332
—Ice on Sidewalk....332
—Sidewalks on Steep Grade...332
for Damages—Crutch in Pavement Hole 316
Treasurer for Deposited Funds 18
Liberty, Personal — Necessity and Reasonableness of Ordinances—Suppressing Indecency 360
License Taxes on Utilities Corporations, Power to Levy....332
Liens—Failure to Complete Contract on Time—Bonding Company Liability 97
Light Company, Validity of Franchise for Water and 185
Lighting Contract, Street—Lamp Size Reduction 97
Limitation of Powers of Municipality 139
Loss, Operation at—Constitutionality —Abandonment of Railway Franchise 394

Merchandise, Storm Sewer Damage to —Negligence of Merchant....360
Mill Constructed Before Town Incorporated—Power to Regulate.... 97
Misrepresentation Made by Municipal Agent—Responsibility of Town....169
Municipal Contract, Doubtful—Construction in Favor of Public.... 18
Corporations—Distinction—Political or Quasi Corporations....375
Functions, Limiting—Power to Build Ice Plant....375
Officers,' Ministerial Functions of—Legitimate Acts—Condemnation Arbitration 332
Municipality, Limitation of Powers of 139

Negligence of Merchant—Storm Sewer Damage to Merchandise....360
of Nurse—Liability—Injury of Patient in City Hospital....360
Nuisance, Destruction of Property by Police in Abatement of....332

Obstruction by Railroad—Right of Egress from Private Property 316
by Sewer Construction, Unnecessary—Cost of Restoring....427
Ordinance Becomes Contract—Prohibition of Poles and Wires....427
,Initiated — Power to Create Transit Commission.... 18
Ordinances by Court, Review of—Wording—Private Bridge on Public Street 360
"Original Construction"—Assessment for Highway 169
Patient in City Hospital, Injury of—Negligence of Nurse—Liability....360
Pavement Hole, Crutch in—Liability of City for Damages 316
Paving Specifications—Separate Rolling of Courses.... 97
Payment—Garbage Removal Contract —Compliance 242
Pedestrian and Automobile on Street, Rights of 242
Physical Disqualification—Retirement of Firemen 375
Poles and Wires, Prohibition of—Ordinance Becomes Contract....427
Police Automobile, Death from—Liability of City....332
in Abatement of Nuisance, Destruction of Property by....332
Power—City Payment for Railroad Crossing Guards.... 97
Power of City to Regulate Construction of School Buildings..242

Political or Quasi Corporations—Municipal Corporations—Disinfection..375
Pollution of Creek by Gas Company Waste—Prosecution 97
Pound Near Residence, Town Hog....360
Powers of Municipality, Limitation of 139
Price Subject of Ordinance—Sale of Asphalt by City....242
Principal's Bond, Recovery by Subcontractor on 169
Property by Police in Abatement of Nuisance, Destruction of....332
Prosecution—Pollution of Creek by Gas Company Waste.... 97
Public Highway—Continuous Use of Street 360
Purchase of Waterworks, Enforceable Contract for—Indebtedness beyond Limit 139
of Right of Way, City—Opening Street 18

Railroad, Construction of Street—Acquisition of Land by City....139
Crossing Guards, City Payment for—Police Power 97
,Use of—Public Easement....360
,Obstruction by — Right of Egress from Private Property..316
Railway Franchise, Abandonment of—Operation at Loss—Constitutionality 394
Franchise, Expired—Renewed by Ordinance—Continuous Trip...427
Reasonableness of Ordinances, Necessity and—Suppressing Indecency—Personal Liberty 360
Reconstruction of Improved Street—Assessment—"Roadway" 169
Recovery by Sub-contractor on Principal's Bond 169
Regulate, Power to—Mill Construction before Town Incorporated.... 97
Removal when Franchise Expires, Compelling Track 360
Remove Unsafe Building, Power to..360
Re-open, Power to—Order of Utilities Commission 394
Residence Street, Undertaking Business in—Power of Restriction 97
,Town Hog Pound Near....360
Responsibility of Commissioner—Speed Limits for Fire Apparatus...360
of Town—Misrepresentation Made by Municipal Agent....169
Restoring, Cost of—Unnecessary Obstruction by Sewer Construction...427
Restriction, Power of—Undertaking Business in Residence Street 97
Retirement of Firemen—Physical Disqualification 375
Right of Way, City Purchase of—Opening Street 18
"Roadway"—Reconstruction of Improved Street—Assessment 169
Rolling of Courses, Separate—Paving Specifications 97

Sale of Asphalt by City—Price Subject of Ordinance 242
School Buildings, Police Power of City to Regulate Construction of....242
Sewer Assessment—Abutting Owner..169
Assessment—Land Already Drained 97
Construction, Unnecessary Obstruction by—Cost of Restoring 427
Damage to Merchandise, Storm—Negligence of Merchant 360
Sickness—Dismissal—Insubordination of Employe 18
,Liability for—Street Depression Filled with Water.... 97
Sidewalk, Ice on—Liability of City..332
Sidewalks on Steep Grade—Liability of City 332
Specifications, Paving—Separate Rolling of Courses 97
Speed Limits for Fire Apparatus—Responsibility of Commissioner....360
Statutes in Force Part of Contract...394
Stone Cutting in City, City Contracts Specifying—Lowest Bidder....169
Street Above Ditch, Raising Grade of —City Liable for Flood Damages..242
Assessments—Judicial Status of Council 185
,Continuous Use of — Public Highway 360
,Defective Condition of—Liability of City....332
Depression Filled with Water—Liability for Sickness.... 97
Improvement Assessment on Industrial Property 169
Improvements—Irregular Assessments 360
Lighting Contract—Lamp Size Reduction 97
,Opening — City Purchase of Right of Way.... 18
,Reconstruction of Improved—Assessment—"Roadway" 169
,Rights of Pedestrian and Automobile on 242
,Unopened — City Liability for Injuries 169
,Vacation of—Review of Ordinances by Court—Wording—Private Bridge on Public Street 360
Sub-contractor on Principal's Bond, Recovery of....169

Taxation, Exemption from—Power of City to Encourage Factories....360
Taxes on Utilities Corporations, Power to Levy License 332
Taxing Power and Contracts Modified by Legislature 394
Track Removal when Franchise Expires, Compelling....360
Transit Commission, Power to Create —Initiated Ordinance 18
Treasurer for Deposited Funds, Liability of City.... 18
Trip, Continuous—Expired Railway Franchise—Renewed by Ordinance 427

Unopened Street—City Liability for Injuries 169
Unreasonable Exercise of Power—Act of General Assembly 375
Unsafe Buildings, Power to Remove..360
Utilities Commission, Order of — Power to Reopen 394
Corporations, Power to Levy License Taxes on....332

Validity — Waterworks Bond Issue Election 97
of City Contract—Knowledge of Council 185
of Franchise for Water and Light Company 185
Venereal Disease Examination—Legality of Requirement....394
Village Trustees to Establish Fire Limits 256

Water and Light Company, Validity of Franchise for 185
Diverted by City—Ice on Sidewalk 256
Waterworks Bonds Issue Election—Validity 97
,Enforceable Contract for Purchase of—Indebtedness Beyond Limit 139
Wires, Prohibition of Poles and—Ordinance Becomes Contract 427

Author Index

Acheson, Wm. M.,
"Developments in Brick Paving" 294
Bamman, F. C.,
"Army's Utilization of Camp Wastes" 304, 322
Bennett, C. S.,
"An Unusual Concrete Highway Bridge" 368
Blanchard, Arthur.
"American Methods and Machinery Applicable to Construction and Maintenance of French Highways" 23
Brainard, John T.,
"Metering Private Sprinkler Systems" 369
"Lancaster's Remodeled Pumping Plant" 173

Bunker, Geo. C.,
"A Siphon Reservoir Blow-off".. 83
Collins, James H.,
"Home Buying in Detroit" 384
Geiger, Charles W.,
"Oil Construction for the Streets" 380
"Oakland Municipal Garage Shop" 260
Gillette, Halbert P.,
"Cost Keeping for Highway Contractors" 236
Greenough, Maurice B.,
"The Manuacturers' and the Contractors' Point of View".....149
Hall, Harry R., and Robert B. Morse,
"Progress of Water Disinfection in Maryland".....405
Hardenbergh, W. A.,
"Red Coats for Rodmen".....436
Hardenburg, W. E.,
"Truck Transportation of Laborers and Materials".....229
Hess, John Rositer, Jr.,
"Improving Providence Water Supply" 350
Kingsley, E. A.,
"French Roads in the War"..... 67
"Some Lessons from French Roads" 176
"National Roads" 293
Knowlton, W. T.,
"Testing a New Flush Tank"...247
Lovejoy, C. H.,
"Steam Heated Bitumen Extractor" 130
McElroy, James A.,
"Sewage Treatment at Bridgeport" 363
Metcalf, Leonard,
"The War and the Water Works" 451
Morse, Robert B., and Harry R. Hall,
"Progress of Water Disinfection in Maryland" 405
Oliphant, John,
"Air-Lift Artesian Well".....249
Peterson, Arthur,
"A Garbage Crematory with Self-Respect" 204
Routh, James W.,
"Rochester's Sewer and Paving Specifications" 84
Shafer, Chester W.,
"Street Signs at Camp Custer"..
Simpson, John,
"Municipal Powers as to Garbage" 382
"Shade Trees in Streets".....432
Stinchcomb, W. A.,
"The Engineer in Politics".....388
Weller, W. Earl,
"Binghamton Sand Catcher".....191
Whitten, Robert H.,
"Width of Roadway and Corner Cut-Off" 166

LANDSCAPE ARCHITECTURE

MUNICIPAL JOURNAL

ISSUED WEEKLY

HARVARD UNIVERSITY SCHOOL OF LANDSCAPE ARCHITECTURE

VOLUME XLVI
No. 1

January 4, 1919

JAN 10 1919

$3.00 a Year
10 Cents a Copy

OFFICE OF THE MAYOR
CITY OF KINGSTON—NEW YORK
Kingston, N. Y., December 2, 1918.

Willite Road Construction Company of New York, Inc.,
51 Chambers Street,
New York City.

Gentlemen:—

At the completion of two years' relations with your Company in the laying of Willite pavement in our City, I desire to take this opportunity to express our appreciation for the satisfactory results which have exceeded our expectations.

During the past two years your Company has laid about ten miles, or over 150,000 yards of Willite, and the demand for additional Willite Streets exceeds the financial capacity of the Board of Public Works for such purposes.

The pavement is attractive in appearance, is smooth, hard and uniform, and is sanitary. Some of the pavements laid during the first part of the Summer of 1917 have been subjected to heavy traffic and have shown a remarkable durability as their wearing qualities have not been disturbed. They resisted without any ill effects the extraordinary frost of last winter. Another appealing quality is the dispatch with which the work is carried on, and the short time required after it is laid when the street can be put to use. Its noiseless and non-slippery qualities have also proved its worth. In our opinion the price is very favorable compared with other types of pavement.

I also desire to attest to your fairness in all your dealings with the City and your efforts to please the City and the public.

Respectfully,
(Signed) PALMER CANFIELD, JR.,
Mayor.

GENERAL OFFICE:

WILLITE ROAD CONSTRUCTION COMPANY OF AMERICA

51 Chambers Street, New York City

SUBSIDIARIES:

Willite Road Construction Company of New York
Willite Road Construction Company of New England
Willite Road Construction Company of Illinois
Willite Road Construction Company of Ohio
Willite Road Construction Company of New Jersey

Table of Contents, Page 3

Index of Advertisements, Page 38

Books on Street and Road Construction and Maintenance

A LIST OF THE LATEST AND BEST BOOKS

Practical Street Construction.

By A. Prescott Folwell.

A new book devoted to the practical design and construction of streets. The only one treating of alignment, grade and cross sections, the location of sewers, manholes, fire hydrants, fire alarm boxes, street signs, lighting and other features of the modern city street. Each is considered in respect to its interrelation with all the others. 151 ills.; 242 pp. Price, $2.00.

Dust Preventives and Road Binders.

By Prevost Hubbard.

Deals with the dust nuisance and its prevention. This book takes up in detail the chemical composition and physical properties of preventives and binders of every description. The testing, chemical and physical, is described. 416 pp. Price, $3.00.

Highway Engineers' Handbook.

By Wilson G. Harger and Edmund A. Bonney.

The second edition of this book brings the material on top courses up to date. Much data on tests, design, costs, maintenance and specifications have been added, totaling about 100 pages. The arrangement of the book is the same. 609 pp. Price, $3.00 net.

The American Road.

By James I. Tucker.

A non-technical manual on construction, administration and economics of earth roads for practical road builders. Written for local road officials, superintendents, foremen, engineers, county boards, township officers, and all others interested in good roads everywhere. Illustrated with many examples of what to do and what not to do. 235 pp. 47 ills. Price, $1.67.

Text Book on Highway Engineering.

By Arthur H. Blanchard and Henry B. Drowne.

The foundations and general principles of construction of the various types are discussed. Street cleaning, car tracks, pipe systems and other improvements are dealt with. There is a chapter on economics, administration and legislation. 762 pp. Price, $4.50 net.

Elements of Highway Engineering

By A. H. Blanchard.

Published in 1915. Is written with a view of emphasizing fundamental principles and is especially adapted for civil engineering students and for general reference. 497 pp. Price, $3.00 net.

ORDER FROM

Municipal Journal, 243 West 39th St., New York

Ask us for information about this cart.

HOLZBOG CARTS ARE SANITARY

No spilling or leaking—easily loaded because built low—neatly and cleanly dumped.

Never a nuisance because airtight and watertight. Carry garbage, night soil, ashes, sweepings, catch-basin material, concrete, etc.

Years of real service built into them—sturdy frame and wheels and steel body—simple dump gear.

Make a clean job of the city's dirty work.

Built with two and four wheels for one and two horses.

GEO. H. HOLZBOG & BRO. JEFFERSONVILLE, IND.

CUMMER ASPHALT PLANTS

All types and sizes

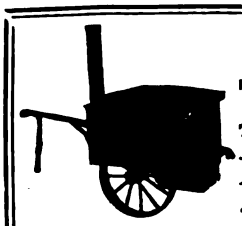
The F. D. Cummer & Son Co., Cleveland, O.

THE ELGIN

Motor Driven Street Cleaning Machinery

ELGIN SALES CORPORATION

501 Fifth Avenue, NEW YORK — U. S. A. — 1340 Old Colony Bldg., CHICAGO



LITTLEFORD

Tar and Asphalt Heaters

The Proof of the Heater is in the Heating.

LITTLEFORD BROS.

451 East Pearl St., Cincinnati, Ohio

MUNICIPAL JOURNAL'S PROPOSAL ADS PAY

for themselves many times over by saving big money on contract prices.

Cost: $2 an inch.

243 West 39th St., New York, N. Y.

Municipal Journal

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York

S. W. HUME, President. J. T. MORRIS, Treasurer and Manager. A. PRESCOTT FOLWELL, Secretary

Subscription Rates:

United States and possessions, Mexico and Cuba.....$3.00 per year All other countries .....$4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the act of Congress of March 3, 1879.

Volume XLVI NEW YORK, JANUARY 4, 1919 No. 1

CONTENTS OF THIS ISSUE

Street Paving in San Francisco (Illustrated) 1

Basalt blocks are used for heavy-traffic streets; for lighter traffic, brick is used on steep grades and asphalt and bituminous concrete on easy grades. Methods of grading and construction, and cost are given.

Savannah's Department of Stables and Shops 3

Sizes of Service Meters 4

Practices and experiences of the Passaic Water Company in the use of meters, especially as to the sizes most desirable. By the assistant superintendent of the company, **W. R. Edwards.**

Water Main Cleaning in St. Louis (Illustrated) 5

Methods and results in cleaning fifty miles of mains, by which from eighty-five to ninety-three per cent increase of capacity was obtained.

Cold Weather and Mains in Duluth 6

Experiences with freezing and thawing of water and gas mains, the ground being frozen eight feet deep.

Concreting in Cold Weather 7

Editorials 9

Public Ownership, Public Control, or What?—Our Duty to the Returning Soldiers—and Ourselves.

Water Works Operation: Reservoir Maintenacence 10

Investigating and locating leaks in reservoirs, and methods of stopping them.

The Week's News:

Roads and Pavements..... 13

City Must Pay for Streets Without Special Benefit, Philadelphia, Pa.—Road Renamed for Pershing, Jefferson City, Mo.—To Spend $3,525,200 for Oregon Roads, Portland, Ore.

Water Supply 13

City Increases Water Rates, Middletown, Ohio—Denver's Waterworks Under City Ownership—Commission Orders Complete Metering, Newport, R. I.

Street Lighting and Power..... 14

Work of Canadian Provincial Hydro-Electric Commission, Toronto, Ont.—New Power Plant for Scotch City, Glasgow, Scotland.

Fire and Police..... 14

No Increased Pay for "Inactive" Sergeants, Yonkers, N. Y.—Fire Sweeps Business District, Burlington, N. C.—Aerial Police for New York City—Wiping Out the "Red Light" Districts, Washington, D. C.

Government and Finance..... 15

Capital Issues Committee Suspends Work, Washington, D. C.—Reconstruction Committee Appointed, St. Louis, Mo.—Single Tax Plan Defeated, Sacramento, Cal.—Secretary Baker Asks Hastened Construction Work, Washington, D. C.—Wants State Regulate Haphazard Tax Collection, Albany, N. Y.—Advisory Committee to Study State Economy, Sacramento, Cal.

Traffic and Transportation..... 16

Buffalo to Vote Again on Higher Fares—No U. S. Aid for Hudson Tunnel, Washington, D. C.

City Planning and Housing..... 17

Senate Orders Stop to Goverment Housing, Washington, D. C.—New Memorial Building for Toledo—Expert Declares Philadelphia Housing Menace.

Miscellaneous 18

Proposes Foods Be Classed as Utilities, New York, N. Y.—May Sell War Materials to Public Institutions, Trenton, N. J.

Legal News—Notes of Recent Decisions..... 18

News of the Societies..... 19

Problems Cities Are Studying with Experts.... 19

Industrial News 20

Personals 22

Contract News 23

ASPHALT PAVING PLANTS ALL KINDS

PORTABLE DRYERS
PORTABLE KETTLES
FIRE WAGONS, ETC.

THE HETHERINGTON PLANTS

HETHERINGTON & BERNER

INDIANAPOLIS, INDIANA, U. S. A.

STANDARD

Refined
Mexican Asphalt
(Socony Brand)
for Sheet Asphalt Paving

Possesses sufficient ductility and cementing value to meet all conditions. Unusually rich and yields maximum yardage per ton.

Standard Macadam Asphalt Binders A, B and C
Standard Asphalt Road Oils
Standard Paving Flux
Standard Fillers for Brick and Block Pavement
Standard Bridge Asphalt and Preserving Oil

Specifications and all other particulars furnished upon request.

STANDARD OIL COMPANY *of* NEW YORK
Road Oil Dept. 26 Broadway, New York

BADGER GRANITE

For Paving and All Kinds of Construction Work
Large Stocks. Prompt Deliveries.

The Celebrated Granite Quarries of Waushara County, Wisconsin

Send for Samples and Prices

BADGER CRUSHED GRANITE COMPANY

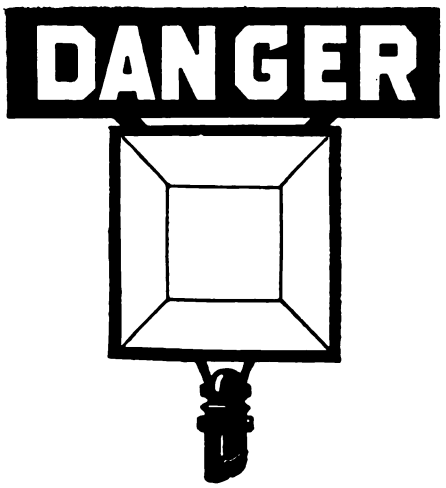
Room 814—133 W. Washington St., Chicago, Ill.

AZTEC ASPHALT

THE
UNITED STATES ASPHALT REFINING COMPANY

90 West Street, New York

WHERE "INDIAN" ROAD OILS ARE MADE. INDIAN REFINING CO., LAWRENCEVILLE, ILL.



STOP those Needless Road Accidents

THE AUTOMATIC (SELF-MAINTAINING) ROAD SIGNAL never fails to give warning to any moving vehicle carrying lights. It is used and recommended by highway commissioners, automobile clubs, railroads and electric traction lines.

In the night season, an Automatic Signal Reflector picks up the white rays of automobile headlights and REFLECTS them RED. If a motorist approaching a bad curve or crossing where an Automatic is installed is carrying lights, he is absolutely certain to be warned.

Why not make an appointment for a demonstration in your city?

The Automatic Signal & Sign Company

Canton, Ohio

Lehman's Vehicle Direction Indicator

A MODERN TRAFFIC REGULATOR

The Lehman vehicle direction indicator consists essentially of a lighted post, so constructed that if accidentally driven into by a vehicle the car can pass over it and the post will rebound to its normal position.

RIGHTS ITSELF WHEN RUN OVER

For Further Information Write

J. H. LEHMAN

ELKHART INDIANA

Hotel Cumberland

New York, Broadway at 54th St.

Broadway cars from Grand Central Depot

7th Ave. cars from Pennsylvania Station

Modern and Fireproof

Strictly First Class

Rates Reasonable

ROOMS WITH ADJOINING BATH
$2.00 up

ROOMS WITH PRIVATE BATH
$2.50 up

SUITES
$4.00 up

Ten Minutes' Walk to Fifty Theatres

— Send For Booklet —

HARRY P. STIMSON FORMERLY WITH HOTEL IMPERIAL

Only New York Hotel Window-Screened Throughout

"Merriman" Steam Melting Asphalt Plants

A Merriman Plant in Operation

The temperature of the liquid asphalt is always under complete control, thus obviating all chances of burning or coking.

The Merriman Mixture retains all the natural oils that give life and wear to bituminous pavements. These are frequently burned out when melting is done by direct fire heat.

Merriman Asphalt plants are built as Two-Unit Road Plants, Stationary Plants of different sizes and One-Car Railroad Plants. They are easily adapted to requirements for asphaltic, concrete, bitulithic or any hot mixture.

These plants have a record of satisfactory work.

Before you buy an asphalt plant, write us for a list of users and investigate for yourself.

East Iron & Machine Co., Lima, Ohio

KOEHRING CONCRETE MIXER

The HEAVY DUTY MIXER, fortified against breakdowns and delays. The Extra Yardage Mixer of high-speed, clean-charging loading skip, liberal drum dimensions and fast discharge. Uniform concrete to the last shovelful of every batch.
Hot Mixers for Bituminous Pavements, and Paving Mixers. Equipped with distributing boom and bucket or spout. Side loading mixers, the right size for every contractor. Write for catalog.
KOEHRING MACHINE CO. Milwaukee, Wis.

Ransome CONCRETE EQUIPMENT

RANSOME CONCRETE MACHINERY CO.
1754 Second St., Dunellen, N. J.
Branches and Agencies in all Principal Cities

LEHIGH CEMENT

NATIONAL

DISTRIBUTION REPUTATION

THORNTON FIRE BRICK CO.

PAVING BLOCK

PAVING AND SEWER BRICK

CLARKSBURG, WEST VIRGINIA

T. J. McAVOY, Pres. D. R. POTTER, Gen. Mgr.

WYCKOFF PIPE & CREOSOTING CO.
30 East 42d St., NEW YORK
Send for Catalogue "D"

WYCKOFF CREOSOTED WOOD BLOCKS

WILL NOT BUCKLE OR DECAY

WYCKOFF CONDUIT for underground wires, and all forms of creosoted wood; also Wooden Water Pipe and Steam Pipe Casings. Creosoting Works and Factory: Portsmouth, Va.

SERVICE FIRST!

IRONSTONE BLOCK

REPRESSED OR DUNN WIRE-CUT-LUG

Terre Haute Vitrified Brick Co., Terre Haute, Indiana

WHEN YOU WRITE ADVERTISERS YOU WILL DO THEM AND US A FAVOR BY MENTIONING

MUNICIPAL JOURNAL

GAMEWELL

Not a Name Only— But

57 Years a Standard For

Trade Mark Registered U. S. Patent Office

FIRE ALARM POLICE TELEGRAPH

No apparatus has ever been shown for Municipal Telegraph Systems that was not either an Imitation of Gamewell Standards or patterned after methods discarded by our engineers.

While "Imitation is the sincerest of flattery" yet when used to protect life and property it is dangerous.

445 John Hancock Bldg., Boston, Mass.
504 Monadnock Bldg., Chicago, Ill.
1410 Keenan Bldg., Pittsburgh, Pa.
1006 Aronson Bldg., San Francisco, Cal.
Northern Electric Co., Ltd., Montreal, Can.
General Fire Appliance Co., Ltd., Johannesburg, South Africa

"SAFETY FIRST" Agencies
Peters Bldg., Atlanta, Ga.
516 Prestorian Bldg., Dallas, Texas
304 Jacobson Bldg., Denver, Colo.
Western Electric Italiana, Milan, Italy
Nissl & Company, Vienna, Austria

United Incandescent Lamp & Electric Company, Ujpest, Hungary
Nippon Electric Company, Ltd., Tokio, Japan
N. O. Heidlof Electro Mechanical & Telephone Works Company, Petrograd, Russia
Western Electric Company, Buenos Aires, Argentine, South America

GENERAL SALES AND EXECUTIVE OFFICE, 5708 GRAND CENTRAL TERMINAL, NEW YORK CITY

THE GAMEWELL FIRE ALARM TELEGRAPH CO. General Offices and Works NEWTON UPPER FALLS, MASS

When Performance Counts

The quality of motor fire apparatus cannot be judged by performance under ideal conditions. It is reliable performance under the exacting drive of actual service that has put the stamp of superiority on American-LaFrance motor fire apparatus.

American-LaFrance Type 31 Tractor attached to Aerial at Norfolk, Va. This tractor was taken to quarters, where, as soon as ice had melted, it was inspected, found to be in perfect condition, and immediately placed in service.

AMERICAN-LaFRANCE ability to meet service requirements unfailingly is the result of our long experience as builders of fire apparatus; an experience that finds expression in the proved excellence of our design and the quality of our construction. The name American-LaFrance has come to stand for extraordinary performance.

AMERICAN-LAFRANCE FIRE ENGINE COMPANY, INC.

Member of the National Automobile Chamber of Commerce
Licensed under the Dyer Patents

BRANCH SALES OFFICES AND SERVICE STATIONS
New York Boston Chicago San Francisco
Portland, Ore. Dallas Los Angeles Atlanta
Denver Pittsburgh Baltimore Minneapolis
CANADIAN FACTORY: TORONTO, ONT.

OKONITE

Reg. U. S. Pat. Off.

INSULATED

Wires and Cables

can be depended upon to meet the most exacting demands of lighting or power service economically and profitably.

A distinguishing mark on OKONITE insulation consists of a single ridge running the entire length of the wire.

OKONITE is made in but one grade —the BEST.

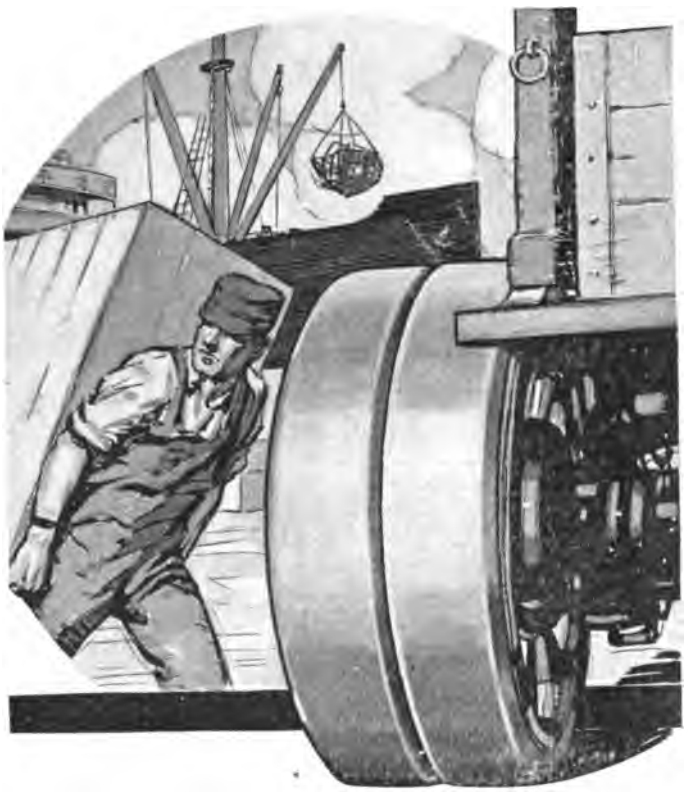
The

Okonite Company

501 Fifth Avenue, New York

General Western Agents
Central Electric Company, Chicago, Ill.

F. D. Lawrence Electric Co., Cincinnati, O.
Novelty Electric Co., Philadelphia, Pa.
Pettingell-Andrews Co., Boston, Mass.



United States Truck Tires

Are Good Tires

A TIRE to fit every particular condition of your transportation needs.
Profit by the good judgment of thousands of satisfied users.

US
UNITED STATES RUBBER COMPANY
RUBBER SYSTEM
AND ASSOCIATED COMPANIES

"W & T" Manual Control Chlorinator Solution Type A

"W & T" APPARATUS
for Chlorine Control

Nationally used and recommended, has attained an enviable reputation for unfailing reliability, economy and permanency.

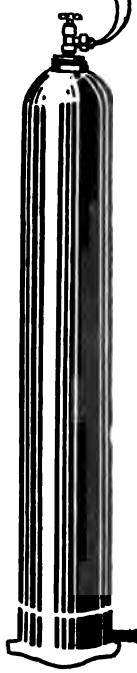
The Standard Chlorinator

Wallace & Tiernan Co., Inc.
349 Broadway, New York
Chicago Office: 550 People's Gas Building

Canadian Representatives: The General Supply Co. of Canada, Ltd., Ottawa, Montreal, Toronto, Winnipeg, Vancouver.

Pacific Coast Representative: Kenneth Shibley, Merchants' Exchange Building, San Francisco, Cal.

"Liquid Chlorine"



Our liquefied chlorine gas is especially prepared for application to public and private water supplies and is the Purest Chlorine on the market.

Write for a copy of "Wise Cities" and get some startling facts.

ELECTRO BLEACHING GAS CO.
Pioneers and Leading Manufacturers of Liquid Chlorine
19 East 41st Street, New York
Chicago Office: 11 South La Salle Street
Canadian Representative:
General Supply Co. of Canada, Limited, Ottawa, Toronto, Montreal, Winnipeg, Vancouver

Liquid EBG Chlorine

Direct Oxidation Process Corp.

LICENSEE

WATER and SEWAGE TREATMENT

15th Street and Lehigh Avenue Philadelphia, Pa.

MICHIGAN PRODUCTS

Fire Hydrants	Shear Valves
Gate Valves	Tide Valves
Sluice Gates	Sleeve Valves
Check Valves	Indicator Posts
Foot Valves	Valve Boxes

Flower-Stephens Manufacturing Co.
105 Parkinson St., Detroit, Mich.

THE FIRST CAST IRON PIPE EVER MADE IN THE WORLD'S HISTORY IS STILL IN SERVICE • MORE THAN 250 YEARS OLD •
SERVICE [redacted] MEASURED BY [redacted] CENTURIES

The Cast Iron Pipe Publicity Bureau
1 BROADWAY NEW YORK

Municipal Journal

Volume XLVI. NEW YORK, JANUARY 4, 1919 No. 1

STREET PAVING IN SAN FRANCISCO

Basalt Blocks for Heavy Traffic, Brick for Steep Grades and Asphalt and Bituminous Concrete for Easy Grades—Methods of Constructing Base and Wearing Surface—Grading Streets—Cost.

Practically all of the standard modern types of pavement can be found in San Francisco, but the engineers endeavor to use each under the conditions for which it is best adapted. As there is no strict city ordinance limiting the loads that trucks may haul, very heavy loads must be provided for on the trucking thoroughfares. After trial of the various pavements, the city has found that basalt blocks stand up best under heavy trucking.

BASALT BLOCK PAVING.

During the past two years this type of pavement has been used in repaving Brannan and Bryant streets, both of which traverse the wholesale and manufacturing districts, where there is much heavy hauling. The same kind of pavement had previously been laid on these streets, but on a ten-inch sand base, and after long, hard use the pavements had become in bad condition. One result of the inadequate method of construction was that the wheels of heavy trucks, when striking the edge of a block, would cause it to tip from the vertical, giving a rough surface to the pavement.

In repaving the streets, the old blocks were first removed and hauled to the yard, where they were redressed to be six to seven inches long, three to three and a half inches wide and five inches deep. The blocks were redressed by contract, the city paying $21 per thousand. (A few weeks ago the city was paying $21.50 per thousand, while in 1917, in recutting the blocks for Brannan street, the price was $17.50 per thousand). These blocks if bought new would cost $65 to $70 per thousand. About one million blocks were used in repaving Bryant street.

Concrete Base. The blocks are laid on a six-inch concrete base with a two-inch sand cushion, the base being composed of one part cement, three parts of graded sand and seven of coarse aggregate; or a proportion of 1:2½:6 is used if the materials employed are better adapted to this proportion. In measuring the aggregate, wheel-barrows are used of such capacity that a certain number, with their contents struck to be exactly full, will give the desired proportion. The water also is measured, it being required that the mixer be equipped with a suitable automatic water tank. Batch mixers only may be used, each batch to remain in the mixer at least one minute, during which time the drum must make not less than fourteen nor more than eighteen complete revolutions. The mixer

FIG. 1—CENTER STRIP OF BASALT BLOCKS WITH SIDE STRIPS OF ASPHALT.

must be provided with a device for counting the number of revolutions of the drum. Machine mixing is required for any work that involves the placing of more than ten cubic yards of concrete or covering a superficial area of more than 500 square feet. If carts or cars are used for transporting concrete, they must be of a type which requires turning the contents over on depositing, and must dump the concrete on a metal platform, from which it is shoveled into place; except that if the length of haul is less than 300 feet it may be dumped in place and immediately spread. After being spread, the concrete is immediately tamped, one tamper being required for each 300 square feet of foundation or fraction thereof placed per hour. For wearing surfaces of basalt or other block type, the surface of the base is not permitted to have projections above the general surface in excess of one-quarter inch.

The finished concrete base is wet on each of two days following its completion and is protected from traffic for at least seven days by covering it with a layer of planking at least two inches thick or by temporarily closing the street in whole or in part.

Wearing Surface. In laying the pavement, the blocks for a distance of 24 inches out from each curb are set in lines parallel with the curb; the blocks for this portion of the pavement being selected with a special view to secure uniformity of width. They are then thoroughly rammed to bring their tops to a uniformly smooth surface. On the rest of the roadway the blocks are set in lines at right angles to the axis of the street. At crossings they are set at angles of 45° with the lines of the streets, the lines of blocks meeting along the center lines of the streets in herring-bone fashion, the diagonal construction beginning at a line two feet outside of the crosswalks.

It is required that the joints of the blocks average not less than one-half nor more than three-quarters of an inch in width. Previous to ramming, the joints are filled with dry, hot, fine gravel which will pass a one-half-inch screen and be rejected by a three-sixteenth-inch screen. When the ramming has been completed the joints are filled with more dry, hot gravel, if necessary to bring this to within two inches of the surface, gravel being raked out of the joints where necessary to secure two inches depth from the top. While the gravel is still warm, the joints are poured full of hot asphaltic cement or paving pitch applied at a temperature of 250° to 350° until the joints will take no more. Fine beach gravel is then spread over the pavement in a thin layer.

On Bryant street the blocks were placed on a two-inch sand cushion, rolled with a five-ton roller, and the joints filled with cement grout. On Brannan street, from Third street to Sixth street, the blocks were set directly on the wet concrete, making a so-called monolithic pavement eleven inches thick. On Bryant street the mixer used was a Foot No. 5 batch mixer operated by a gasoline engine. The crew consisted of eighteen men, which completed an average of 8,000 square feet of concrete a day.

Grading Streets. In preparing for the paving of Bryant street, the grade had to be considerably improved, as it was very uneven, and the street was raised twelve to fourteen inches in some places and lowered an equal amount in others. There are two tracks of a street railway in this street, and it was intended to relay the street railway at the same time that the city carried on the grading; but the railway company was unable to obtain the material for this work and the city was unable to wait longer before making the pavement repairs, so it regraded and repaved the sides of the streets, leaving the tracks in some places above and in others below the new pavement. The street railway, when it regrades and reconstructs its tracks, will be required to repave its right-of-way also.

It is now the practice in San Francisco to widen all of the old roadways when they are paved, and both Brannan and Bryant streets were widened On Bryant street, four feet was taken from each sidewalk, which still leaves sidewalks fifteen feet wide and a roadway 58 feet wide, this giving room for two lines of vehicles on each side of the street car tracks. In widening the roadway it was necessary to move back the catch basins, fire hydrants, etc., also to raise or lower them to conform to the new grade.

In grading Brannan street, it was necessary in some cases to make fills as deep as five feet. Meantime, before the laying of the pavement, the public utility companies rearranged their conduits, pipes, etc., so as to conform to

FIG. 2—REGRADING BRANNAN STREET PRIOR TO PAVING.

the new width of the streets. Water mains also were recalked to minimize the necessity for digging up the street in the future.

Two men were employed in removing the traps from the old catch-basins and the pipes leading from them to the sewer. Unless it was necessary to break down the top of the basin for lowering the street grade, the basins were merely filled up; but the basin heads were moved to the new position and used again. The same men dug the hole for the new catch-basin and a new trench from this to the sewer. The new basin connection was laid and the new basins built by another crew of three men, who averaged from one to three new basins a day, depending upon the obstructions encountered. The basins were made of brick, including the bottom, and the inner surface plastered with one-to-one mortar. Traps were placed in the basins and they were connected with the sewer by means of ten-inch vitrified pipe.

The old stone curb was removed and any pieces that were four feet or more in length and that could be used again were redressed and used, while that that could not be so used was broken up for concrete aggregate or was recut and used for header blocks on the Market street pavement. The new curbing was required to be six inches thick on top and on the bottom and twenty inches deep. The top, and the face for a depth of six inches, were dressed to a true surface, while the back of the stone for a depth of two inches was so dressed that inequalities from a true surface should not exceed one-half inch measured from a straight-edge. In repaving Brannan street, 5,071 feet of old curb was redressed and used again. Stone curbs are being replaced gradually with concrete curbing on practically all streets except those in the heavy hauling districts.

In grading, the subgrade was made fourteen inches below the finished grade. All material that was perishable or unsuitable to support the pavement was removed and replaced with sand or other suitable material. The entire surface of the subgrade was then thoroughly compacted by rolling with a ten-ton roller and by tamping, with the generous use of water, special pains being taken to get the filled-in sections uniformly and thoroughly compacted. After the subgrade had been rolled and checked for surface grade by the engineers, it was covered with planks three inches thick and ten inches wide. This planking was left on the subgrade to protect it, the concrete mixer, the concrete aggregate and the teaming and other handling of material being thus prevented from cutting up the subgrade. The planks were removed only as the concrete was placed. Wherever it was found necessary, the subgrade was thoroughly wet just in advance of laying the base to prevent the absorption of water from the concrete.

Cost of Paving. As an illustration of the cost of basalt pavements, the following figures are given of the cost of six blocks of Brannan street; built in 1916-1917:

			Unit Cost.
Curb—8,090 ft. (410 ft. old):			
Labor and teams	$2,543.43		
Redressing, 5,071 ft. @ 62c	3,144.02		
New curb, 2,609 ft. @ 75c	1,956.75		
		$7,644.20	0.94
Grading:			
Labor and teams	11,167.08		
1066 yds. full @ 10c	106.60		
Concrete—147,600 sq. ft.:			
Labor and teams	5,221.62		
Cement, 9,289 sacks @ 50c	4,644.50		
Crushed rock, 77 yds. @ $1.00	77.00		
Crushed rock, 2,207 yds. @ $1.25	2,758.75		
Sand, 166 yds. @ $1.00	166.00		
		$24,141.55	0.164
Basalt Blocks—130,135 sq. ft.:			
Labor and teams	10,150.33		
Basalt blocks, 650,067 @ $17.50	11,386.81		
Cement, 172 sacks	86.00		
Gravel, 3 yds	3.75		
Asphalt, Grout, @ 4c per sq. ft.	5,205.40	$26,832.29	0.206
Total unit cost of pavement			$0.370

(To be concluded)

SAVANNAH'S DEPARTMENT OF STABLES AND SHOPS.

The City of Savannah maintains, under the charge of Chief Engineer E. R. Conant, a Department of Stables and Shops, the duties of which include the care and feeding of all live stock, the maintenance of and upkeep of all vehicles and rolling stock. All wagons are built new, purchases being only made for wheels, axles and minor castings, used in the construction of same. All harnesses used in the various departments are repaired at the lots and all cart and wagon harnesses are made in the harness shop. All painting required for the rolling stock and vehicles is done in the paint shop, and to a considerable extent outside work is done at the market, maintaining bridges, etc., by the employes of this department. Besides the above, horseshoeing of all stock of departments under the public works office is done without loss of time that would ensue if the work was done by outside parties.

During the year 1917 the average number of stock on hand was 160 head. Only five head of stock died, five were sold, and 18 head of stock were purchased during the fiscal year. Twenty-eight thousand bushels of oats, 560 tons of hay and one ton of mixed feed was purchased.

FIG. 3—BRANNAN STREET GRADED AND PAVED WITH BASALT BLOCKS.
View from mid-distance of Fig. 1, looking in the same direction.

The cost of feed for the year, including drayage to the lots, was $38,000. Of this amount $8,000 worth was distributed to the Police and other departments. At the end of the year there was feed on hand valued at $2,000, so that the cost per animal for feeding during the year was $14.50 per month.

The number of two-horse wagons built during the year was eight, the average cost of which was $156. The number of new carts built was ten, the average cost of which was $47; the number of machine brooms refilled, 134, the cost of which was $6.47 each; the number of paper boxes built for use in lanes was 46, at an average cost of $8.00 each. In addition to the routine work done at the shops, the regular force made certain improvements at the City Market, consisting of building 13 chicken coops, 13 tables, closing opening to prevent birds entering the building, plastering and whitewashing several vaults, putting in window frames and glasses, supervising the painting of the Market and other miscellaneous work.

The payroll for the stables and shops amounted to $9,344. With the exception of $1,695 used for the maintenance of buildings and for the office force, this amount is charged against the several departments for which the work was done.

SIZES OF SERVICE METERS*

Practices and Experience of the Passaic Water Company in the Use of Meters, Especially as to the Sizes Most Desirable.

By W. R. EDWARDS.†

The controlling principles involved in determining the size and make of meter service should be economy and efficiency. Usually the water department furnishes the meter, and must keep the capital expense as low as possible, consequently the smallest meter that will do the work in any particular case is desirable. Fortunately the second requirement of efficiency is usually obtained by the same selection.

Oversizing is, in my opinion, a common fault, and it is better to err in the opposite direction, as in that case your attention will be directed to the error by the consumer complaining of poor service, while on the contrary, if the service is oversized in the meter used, a substantial loss may be sustained by the department in underregistration. The oversize meter will not register all the water passing through it and costs more.

Our experience, covering twenty years in time and the setting, care and handling of some twenty-two thousand meters, is that no matter how careful we may have been, we have in the past allowed ourselves to be influenced by the opinion of property owners, mill engineers, architects, etc., with the result that much larger meters were installed than were necessary. That our judgment has been swayed is clear by our experience following the installations of the first five or ten years. A careful watching of the performance of individual meters by following their registration, semi-annual tests as to sensitiveness and accuracy, watching the difference in amount of water recorded following reduction in size or change in type of meter on a particular service, soon made the fact clear that in many cases we had been using meters of too large capacity. This range covered the use of ¾-inch and 1-inch meters for residential service where ⅝-inch was sufficient, to factory or commercial use where from 1½ to 6-inch meters were being used in situations that could better be served by ¾-inch to 2-inch meters.

For the last ten years, during which our business has developed at least 62.8 per cent and the number of meters in use has increased by 99.9 per cent, we have not found it necessary to buy many meters above ⅝-inch in size. The demands of a growing industrial section for meters of a size larger than this has been met by the withdrawal from service of meters which had previously been set larger than necessary; these being replaced by smaller meters or meters of a different type more suitable for the particular service.

RULE ADOPTED FOR METER SIZES.

Our experience has led us to establish a general rule covering residential installation, and this rule is as follows:

Up to 6 families, a ⅝-inch meter,
From 6 to 12 families, a ¾-inch meter,
From 12 to 18 families, a 1-inch meter,
From 18 to 25 or 30 families, an 1½-inch meter.

For commercial or industrial service, the size and type of meter to be used is determined after having considered all the information available as to probable quantity to be used and rate at which it will be drawn. Bearing in mind also, in determining the size, the psychology of the water user and knowing that it is easier to increase than to decrease the size, and that such a change would leave a pleased customer, we are careful not to get an oversize original installation.

The objection of the customer to the placing of a meter of a smaller capacity than his judgment indicates necessary, is usually satisfactorily met by the assurance that if found necessary after trial, a larger size will be installed without expense to him.

Where the service demands a large volume at times, with the necessity of taking care of small flows either of use or leakage, the compound type of meter has been found suitable. This condition frequently arises. For example, for a small-town service, where fire protection is of primary importance but where the ordinary range of draft is greater than that provided for in a Venturi meter of proper size, a compound meter, which has a current meter for the larger demands with a positive measurement meter for the smaller, is the most suitable type. This condition is also met in many public buildings where "flushometers" are installed; although for apartment houses and the smaller tenements where the installation of compound meters of comparatively large size would be necessary to provide for the large flow demanded by flushometers, the use of flushometers is discouraged.

We agree with Mr. Saville in his conclusion in his excellent paper read before the New England Water Works Association on November 14,† that it is more effective and economical to install a larger *service* than has heretofore been the custom than to use a larger *meter*. Loss of head can be overcome more readily, more economically, and more effectively by using a larger service than by the size and type of meter.

Where a larger flow for short intervals is desired than can properly be provided for by the department and still give consideration to accurate registration and first cost of installation, such as filling tubs in a dyehouse (of which we have a great many) or providing for the demands of flushometers, the service may be secured by the use of tanks. This shifts the burden of the extra expense of installation from the water department to the customer, but this is justifiable, in our opinion.

Our invariable rule is to use a meter of smaller size than the service to which it is attached. Installations

*Paper before New York section of American Water Works Association.
†Assistant Superintendent, Passaic Water Company.

†See Municipal Journal for December 7.

are all made so that a meter can be changed to a different size or type readily and with little expense, in order that changes in use or unforseen conditions may be taken care of easily and readily.

The determination of the size of the service and the size and type of the meter to be used for any consumer should be with the water department. The operator of the department does or should know what is required both for proper service to the customer and for economical and efficient service for the department.

All meters larger than 2-inch in size are installed so that they can be tested in service without the interruption of the service, and such tests are made twice yearly. All smaller meters are removed for periodical tests, the period being determined by the service which the meter is rendering, or by the requirements of the State Utility Commission, which requires that all meters must be tested after a fixed number of years of service, or after having passed a certain quantity of water, depending on the size.

In conclusion, we agree again with Mr. Saville, that more care is needed in the selection of meters for particular service. The selection should be made by a man experienced in the supplying of water and with an accurate knowledge of the mechanical qualities of meters, their limitations and possibilities.

Much money can be saved a department both in installation and operating cost, and in securing a full registration of all water delivered, by proper attention to details. Then, after the selection as to size and type has been made, we must not be lulled into false security. The water meter is a machine that needs watching. The department has this pecularity frequently called to its attention by the irate consumer with the high bill, but it should also be warned by the unusually low bill. The price which must be paid for maintaining revenue is eternal vigilance.

DISCUSSION.

In reply to questions, Mr. Edwards said that the company repaired all meters, charging the consumer, however, for repairs due to frost or hot water. One of the towns served by the company is 100 per cent metered, another 80 per cent and a third, 70 per cent. In the first, 65 per cent of the water is accounted for.

WATER MAIN CLEANING IN ST LOUIS.

Methods and Results in Cleaning Fifty Miles of Mains—From Eighty-five to Ninety-three Per Cent Increase in Capacity.

Fifty miles of mains that had been in service for twenty-five years or more in St. Louis, Mo., became so coated with deposits and filled with mud that it was decided by the water department that it would be advisable to have them cleaned. Accordingly, in the fall of 1917 a contract was let for cleaning approximately this total lengths of mains, the sizes of which ranged from 6 inches to 20 inches. The work began shortly thereafter and was continued during 1918. The cleaning is being done by the National Water Main Cleaning Co.

An average of about 8 tons of deposits per mile of main was removed. The increased carrying capacity resulting is shown by the following figures from tests made on three mains, one 20 inches in diameter, one 12 inches and one 6 inches.

The coefficient of flow for the 20-inch was 56 before cleaning, and 108 after cleaning, an increase of 93 per cent; the final coefficient being 97 per cent of that of new pipe.

*Considered as a ring of uniform thickness around the circumference. The probability, however, is that the greater part of the deposit was not so distributed, but was massed in the bottom of the pipe.

The coefficient for the 12-inch was 54 before cleaning, 100 after cleaning—an increase of 85 per cent; the final coefficient being 92 per cent of that of new pipe.

The coefficient for the 6-inch pipe was 48 before cleaning and 92 after, an increase of 92 per cent; the final coefficient being 89 per cent of that of new pipe.

In reporting on this work, William A. Foley, principal assistant and acting engineer in charge of the Distribution Section, said:

"Due to house-to-house inspections, before and after cleaning, consumers were inconvenienced but slightly from choked service connections.

"The incrustation removed in the cleaning process is

While Cleaning Machine Is Moving Through Main.

Just as Machine Is Ejected from Main.

As Water Is Clearing Up.

Clear Water Coming Through Clean Main.

CLEANING 20-INCH WATER PIPE IN ST. LOUIS.

composed of lime, silt and mud, mixed with an iron deposit which adheres firmly to sides of pipe. In addition to this natural incrustation, rocks, sticks and sundry other articles were removed during the cleaning process. A fair estimate of the amount of deposit removed can be gained from the following: 150,500 lineal feet of various sizes cleaned shows an aggregate dry volume of 7,187 cubic feet, amounting to 143 wagon loads, or a little over four wagon loads per mile cleaned.

"The cleaning has been of vast benefit to the department in increased water volume and should be continued until all mains 6 to 20 inches in diameter in service previous to 1906 have been cleaned."

Some of the data concerning the cleaning done up to April 1, 1918, are as follows:

20-inch mains: Total length cleaned, 28,322 ft. Tons of deposit removed, 91.66. Average area of cross-section of deposit, 13.6 sq. in. Average thickness of deposit,* .218 inch.

12-inch mains: Total length cleaned, 77,102 feet. Tons of deposit removed, 127.34. Average area of cross-section of deposit, 6.88 sq. in. Average thickness of deposit,* .186 inch.

8-inch mains: Total length cleaned, 9,951 feet. Tons of deposit removed, 8.88. Average area of cross-section of deposit, 3.72 sq. in. Average thickness of deposit,* .15 inch.

6-inch mains: Total length cleaned, 34,956 feet. Tons of deposit removed, 15.12. Average area of cross-section of deposit, 0.865 sq. in. Average thickness of deposit,* .047 inch.

COLD WEATHER AND MAINS IN DULUTH.

Experiences with Freezing and Thawing of Water and Gas Mains—Services Thawed by Electricity—Ground Froze Eight Feet Deep.

Although the winter weather of 1917-1918 was the most severe and trying to water works superintendents of any for many years past in the majority of cities, in Duluth, Minnesota, the freezing conditions of the winter season of 1916-1917 was much more severe. It may therefore be interesting to narrate some experiences of that winter as it affected the operation of the distribution systems of the Duluth Water and Light Department. The information was furnished us by D. A. Reed, engineer of the department, and E. W. Kelley, the engineer of the department at that time.

The winter of 1916-1917, as experienced at Duluth, was unprecedentedly severe in certain features. From about December 8 to about March 1, noticeable thawing occurred on only one day. During this period the temperature did not reach the extremes that have occasionally occurred, but persistently and almost uninterruptedly remained below the average. Throughout this period of severe cold there was only an insignificant amount of snow.

The combination of low temperature with lack of snow caused the formation of ice and the freezing of ground to depths before unknown to this locality. For instance, in one place on East Fourth street, where the soil is red clay and the paving asphalt, the ground was frozen to a depth of 8.2 feet. At another place on the West End Hillside the frost was about 9 feet, while on the boulevard a thin layer of frozen earth was still in evidence at a depth of 7½ feet about the middle of June. In the past, frost penetration rarely exceeded about 5½ feet.

It is needless to say that frost penetration to such depth was a very serious matter in the operation of a water-plant. The effect most impressive to the public was the freezing of services. That there was reason for these troubles being prominent in the minds of patrons will be realized when it is understood that more than 1,000 services were thawed by the department, while in the preceding winter only 33 services required this operation. This large number of services froze in spite of the widespread publicity given by the newspapers and department bulletins to warnings and advice to allow water to run continuously to prevent freezing.

These warnings and advice were very generally heeded, too, as is evidenced by the pumping station records. The Lakewood records show 6.5 per cent, 5.5 per cent, 19 per cent, 22.5 per cent and 17 per cent increase for the months of January, February, March, April and May respectively, over the corresponding months of the previous year.

The great depth of frost penetration resulted in its presence in the ground until very late. This had one odd effect. In May and early June, the normal load on the pumping stations was greatly exceeded because many consumers were being compelled to allow water to waste to prevent freezing, and at the same time a large amount of water was needed and used for lawn sprinkling.

Services were thawed by electrical methods only. The greater part of this work was done by transformers on horse-drawn vehicles. These transformers drew current at 2,200 volts from the Duluth-Edison Electric Company's primaries and delivered it at 110 volts. The current used was sometimes as high as 500 amperes. In this work one secondary terminal of the transformer was attached to a faucet in the premises being served while the other terminal was connected to a street hydrant or to a faucet in a neighboring house. Ordinarily two or three minutes' application of current from these transformers was sufficient. Unexpected difficulty was encountered in a few cases where several service pipes led from a manifold at the curb to the various premises, all being laid in one trench for a part of the way. In these particular cases, it was evidently possible for the current to shunt around the part of the pipe that was frozen, and in at least one such case it was necessary to dig up and disconnect at the manifold before thawing could be accomplished.

Some use was made of storage batteries and of small transformers. The latter drew current at 110 volts from the house lighting circuits and delivered it at 6 volts. The storage batteries and small transformers were of course slower in getting results than were the 30 K. W. transformers, but their greater portability was a very material advantage.

A gasoline engine-driven generator was ordered early in the winter, but was not delivered early enough to be of any value.

Several mains were frozen, also. These were all 6-inch dead ends, where the cover was not normal. Some of these cases were at ravine crossings where shallow cover is usually compensated for by lodgement of snow; in other cases the main was frozen by the draft through a culvert crossing the main; in another, the street was a rock fill across a depression, and there was apparently a circulation of air through the mass. One of the most exasperating places was on Park Point. In this the street surface is scarcely above lake level; in fact, when the mains were laid, water was standing in the street. If mains are laid more than about two feet below water level they are very difficult of access for tapping or repair, and they were therefore laid at about this depth and consequently with about two feet of cover, at this place. The protection against freezing usually given by

submergence did not avail in this case, and the main froze twice within a week before January first, although two ¾-inch "bleeders" were running wide open. Service had to be abandoned at this place.

Frozen mains were thawed by the use of the large transformers. Arrangements were made for wasting considerable water to the sewer by consumers to prevent repetition of the freezing. In a few instances, sufficient water for this purpose was not wasted at first, and freezing occurred the second time.

The damage done to services by freezing was considerable. The department as late as August was still discovering leaks attributable to this cause. Freezing stretches the lead pipe walls, thus weakening them, or produces breaks at the wiped joints.

There were only a few cases of damage to water mains by freezing, probably because it happened that there was some vent for the pressure generated by the expansion of the freezing water. Both of the above mentioned freeze-ups on Park Point, however, burst several lengths of pipe.

The effects of the abnormal season were not so pronounced on the reservoirs. Ice formed to great depth—that in the Endion reservoir, for instance, was over eight feet deep in places. This naturally resulted in appreciably diminished capacity, and in several places loosened the stone block paving on the embankments.

FROZEN GAS PIPES.

The most troublesome effects of all were met with in the gas distribution system. The mains are laid in the same trench with water mains, but are supported on blocking at a somewhat higher level. Throughout a large proportion of the system the mains were surrounded by frozen earth. Water entering the mains in the warmer portions froze upon reaching those stretches surrounded with frost and formed somewhat extensive plugs of solid ice. The entry of water was in some cases through leaky joints, in others through broken services, while there were a few cases in which the gas main was broken squarely off. There were found several instances of services being lifted bodily from the main at the top, stripping the threads or breaking the street ell at this point. In one case a sewer laid over the gas main was frozen below the crossing, the gas main was snapped off directly under the sewer, and liquid sewage escaping through the sewer joints flowed directly into the gas main, resulting in several long ice plugs, which formed successively in all mains leading to a large district. In consequence the supply to this district was entirely cut off for a week, and from some parts of it for a longer period.

The condensation of moisture from the gas itself was negligible, so far as this trouble was concerned. Overland mains, including the 600-foot crossing over the Aerial Bridge, caused no trouble.

There were also, of course, many cases of stoppage of services by frost. Stoppages in service pipe almost invariably yielded to treatment by injecting wood alcohol and, in some cases, of a mixture of hot brine and alcohol.

Removal of ice plugs in mains, however, was not such a simple matter, as these do not yield to the wood alcohol treatment, while injection of brine, if unsuccessful, results in adding ice to that already present. The street crews state that frozen brine is also harder to remove than frozen fresh water.

Electric current will not thaw gas mains. The explanation of this is as follows: The current merely warms the main and thaws a thin layer of ice next the pipe. In the case of a water main, a hydrant or faucet is always left open downstream from the freeze, and the water therefore begins to flow past the stoppage as soon as the least opening is made, and thus thaws the remaining major portion of the ice plug. In a gas main, however, this does not take place, as the temperature of the gas is usually below the freezing point, and in any case its specific heat it too low for the gas to be effective. The only remedy apparent was therefore to apply live steam directly to the stoppage. The steam was supplied from portable boilers through rubber hose. In some cases success was attained by inserting the hose through 1¼-inch holes tapped in the main. In others, it was necessary to remove a section of main bodily and push the hose against the ice face with jointed sewer rods.

Blowing steam into the mains was not successful in any case. The steam hose must be pushed directly against the ice face and must follow it as it recedes.

The most difficult portion of this work was the location of stoppages and of the points where water was entering. In a fairly well gridironed system this may well be compared with finding the proverbial needle in a haystack. The only available method is to dig up the main at what appears the most strategic point—and then almost invariably to guess again and make another excavation. When it is taken into consideration that it required from 24 to 36 hours of continuous labor to reach the main, it can be faintly understood how slow a process is the restoration of service, even though from three to six crews are working night and day, as was the case in this instance.

CONCRETING IN COLD WEATHER.

The following suggestions for carrying on concrete construction in cold weather are abstracted from a pamphlet issued by the Portland Cement Association under the above title.

Concrete work done when the average temperature is below a certain point may cost a little more than the same kind of work done under the usual summer conditions. On the general run of contracting, this cost seldom runs more than 10 per cent above that of work done in warm weather and frequently not more than 6 per cent—sometimes even less. Part of this extra expense comes from applying necessary protective measures, and part results from the lower efficiency of workmen through exposure to the cold. Some of the increased cost may be due to the added time necessary for the concrete to harden, which prevents such speedy progress of the work as would be possible in warm weather.

Heat hastens the hardening of concrete; cold delays it. The effect of cold becomes noticeable in this respect when temperatures are below 50 degrees Fahrenheit, and becomes more marked with the lower temperatures.

The general opinion is that freezing will not injure concrete that has first had an opportunity to harden for at least 48 hours under favorable conditions. If, before early hardening has taken place, concrete is allowed to freeze and thaw at short intervals, it will be damaged. As a rule, concrete will not show any serious effects from having once been frozen if, after it thaws out, it is not again frozen until early hardening is complete. But it is far better to protect the concrete for two or even four or five days.

Mixing water should be heated to and kept at about 150 degrees. This is generally done by discharging steam into it, or by heating it in tanks or kettles over a fire, or by letting it flow through coils of pipe similar to a steam radiator supported horizontal over a fire.

Sand, pebbles or broken stone are generally heated by piling them above and around an old smokestack, iron culvert pipe or old steam boiler; or on a sheet-iron plate supported above the ground by bricks or stones; a fire being built under the plate or inside the cylinder. The

stone or sand should be turned over at intervals to insure that all parts of the mass are plated. Generally they should not be heated above 150 degrees, as great heat may disintegrate the material.

Use of salt in the water is not recommended. It merely lowers the freezing point of the water somewhat; if more than 10 per cent is used it is likely to weaken the concrete; it delays the setting, may corrode reinforcing steel and cause efflorescence on the surface of the concrete.

Protection of concrete consists of some device for keeping motionless air in contact with it, such as canvas supported above a horizontal surface by beams or slats or suspended near a vertical surface; straw, sawdust, excelsior or other loose material laid on a surface and preferably covered with canvas; or a board or canvas structure built over and around it. In very cold weather salamanders, steam pipes, or steam discharged under the covers may be necessary.

In highway work, concrete should not be placed on a frozen subgrade. Methods to be followed in combating the injurious effects of cold weather may be grouped under the following headings:

(a) Application of artificial heat to materials or finished work, and means of preventing the dissipation of heat developed during the setting of the cement. (Heating of water or aggregates; heating fresh concrete by steam lines; the use of covering, etc.)

(b) Use of chemical compounds which will lower freezing point of mixing water, or hasten setting of the cement.

Special care must be taken to avoid the use of lumps of frozen aggregate. This is generally called to attention in the specifications. On account of the frequent moving of equipment, heating of aggregates is not always practicable in road work, although this can be done in other kinds of concrete construction.

If a source of steam supply is available, aggregate may be treated by inserting steam pipes carrying live steam into the piles. This heating will be greatly facilitated by covering the piles with canvas.

A general summary of the suggestions follows:

During the first few days following the placing of concrete, alternate freezing and thawing at comparatively short intervals will damage it.

Protecting the concrete against possibility of freezing is best, even though concrete which freezes before early hardening has been completed may not be permanently injured, if after thawing out it is not again exposed to freezing until hardened.

It is necessary to so mix, place and protect the concrete that early hardening will be complete before the work is exposed to freezing temperatures. To do this:

(1) Sand and pebbles or broken stone used must be free from frost or lumps of frozen materials.

(2) If these materials contain frost or frozen lumps they must be thawed out before using.

(3) As cement forms but a relatively small bulk of the materials in any batch of concrete, it need not be heated.

Although adding common salt to mixing water will prevent freezing of fresh concrete until it has time to harden, there is a limit to the quantity of salt which may be added if the final strength of the concrete is not to be affected. Salt simply lowers the freezing point of the mixing water; it does not supply what is most needed—heat and warmth. It delays, instead of hastens, the hardening of the concrete.

Sand and pebbles or broken stone and mixing water must be heated so that the concrete when placed shall have a temperature of from 75 to 80 degrees.

Some sands are injured by too much heat. The same applies to certain varieties of pebbles and broken stone. A temperature not exceeding 150 degrees Fahrenheit will generally prove most satisfactory.

Place concrete immediately after mixing so that none of the heat will be lost before placing in the forms.

Warm metal forms and reinforcing before placing concrete. Be careful to remove ice and snow and frozen concrete remaining on the forms from preceding work. Forms can be warmed by turning a jet of steam against them or by wetting with hot water.

Even though materials have been heated and the concrete placed immediately after mixing, it will lose much of its heat if not protected from low temperatures, at once.

Protect the concrete immediately after placing. Canvas covering, sheathing, housing-in the work, or hay or straw properly applied will furnish the required protection for different jobs. In addition to these means, small oil or coke-burning stoves or salamanders may be used in enclosed structures. Guard against dry heat.

Temperatures which may not be low enough to freeze the concrete may, nevertheless, delay its hardening for a considerable time. Do not expect concrete placed when the temperature is low and remains low for some time afterward to be safe for use as soon as though placed during warmer weather.

If concreting is unavoidably delayed or interrupted, the work should be covered until concreting is again begun.

Cover and protect any section of the work as soon as completed. In severe cold weather, continue this protection for at least five days.

Forms must not be removed from the concrete work too early. This applies to any concrete work, regardless of season, but is particularly important with work done during cold weather.

Frozen concrete sometimes very closely resembles concrete that has thoroughly hardened. When frozen concrete is struck with a hammer it will often ring like properly hardened concrete. Before removing forms, examine the work carefully to see whether it has hardened or simply frozen. To determine this, remove one board from some section of a form, pour hot water on the concrete or turn the flame of a plumber's blow torch or a jet of steam under pressure against the concrete. If the concrete is frozen, the heat will soften it by thawing the water contained in it.

GARBAGE DISPOSAL IN NEW YORK.

Comments have been received on that portion of the report of the Pittsburgh committee that was given in our issue of December 14 referring to conditions and experiences in New York City, Lewis L. Tribus, of the firm of Tribus & Massa, making the following statements concerning that section of the report:

The city treasury was to gain nothing from the payments to be made by the Metropolitan By-Products Co., but the moneys were to go to the non-mandatory pension fund of the Street Cleaning Department of the boroughs of Manhattan, Bronx and Richmond.

At no time was the Cobwell plant as built, and in many ways an excellent one, able to handle the garbage received for disposal; in fact not over 50 per cent—due, not to lack of labor, but to over optimism as to chemical and mechanical capacity.

The company went into hands of receivers: the State Department of Health declared after very lengthy and thorough investigations and hearings, its operations to be actually and potentially a nuisance. The New York City Department of Health also gave large attention to the matter, and in turn declared operations to be an unqualified nuisance and in violation of contract, and forthwith closed the plant absolutely.

The United States Government had been appealed to, for purpose of keeping the works in operation, even against the good health and comfort of 100,000 Staten Island residents, but absolutely declined to step in. Garbage disposal in these three boroughs is still chaotic. Staten Island (Richmond borough) has continued to handle its own garbage and wastes successfully by incineration, and Queens borough in part.

Municipal Journal

Published weekly at
243 West 39th Street
by
Municipal Journal and Engineer, Inc.

S. W. HUME, President
J. T. MORRIS, Treas. and Mgr. A. PRESCOTT FOLWELL, Sec'y

A. PRESCOTT FOLWELL, Editor
SIMON BARR, Assistant Editor
CHARLES CARROLL BROWN, Western Editorial Representative

Telephone, 9591 Bryant, New York
Western Office, Monadnock Block, Chicago

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

PUBLIC OWNERSHIP, PUBLIC CONTROL, OR WHAT?

Relations between nations are not the only ones that seem certain to be changed as a result of the world war. Most people expect to see those between labor and capital undergo a more or less radical change, with labor having a voice in the control of industry and receiving a greater share of the profits.

Not so much popular attention, however, has been drawn to the changes that seem impending in the relations between public service corporations and the public as represented by city, state and federal governments. The increase of street railway fares and gas and electric lighting rates in numerous localities, and the assertion in some states and denial in others by the public service commissions of their power to alter rates fixed by franchise or by city authorities under the terms of franchises, are both causes and symptoms of the changes that seem to be impending.

The users, on the one hand, are objecting to the increased rates and, in many cases, to the poorer service experienced during the past year. The companies complain that, unless they can increase their incomes, financial ruin is certain; and even where they have been permitted to increase rates, they claim in many cases that reduction in volume of business resulting from increased rates prevents their profiting sufficiently to avert bankruptcy. Then, too, labor is being supported by federal and state boards in its demands for higher wages, or where not so supported is otherwise making itself a thorn in the flesh for the companies.

Altogether, to many of the managers and officials of public service enterprises the future has by no means a rosy look; and, as stated in these columns a few weeks ago, many of them favor turning such enterprises over to the public.

There is the other side, of course—a side which chiefly is responsible for the failure of the public to entertain much sympathy for the companies. In few if any cases can it be said that the income will not meet operating expenses, but the deficiency is in the ability to pay interest on bonds and dividends on preferred and common stock; and the public have good reason for suspecting that in many if not the majority of cases a large part of the stock is water, or that stocks and bonds represent purchase of competing lines or other property that is unnecessary for the service rendered.

The final outcome is far from certain. It is even uncertain what solution would be best for the companies, what best for the public, or what best for all concerned. Shall the public take over the lines? Many cities contemplate doing so and one state has recently passed a law authorizing two or more cities to combine in the ownership and operation of interurban street railways.

Or shall the cities and states refrain from public ownership, but exert more comprehensive control of the private owners? This is now more generally favored by the public (where the public service commissions are not believed to have come under the control of the corporations), but a point has apparently been reached where a change must be made, if not in the fundamental principles of control at least in the manner of applying such principles.

The vital necessity is to keep the utilities operating and to secure a high grade of service to the public. If or where it is really the case that such service can not be given under existing conditions, then conditions must be changed in some way. What form such change shall take in each case is one of the most important questions to be solved by our city and state administrators during the next year or two of post-war reconstruction.

OUR DUTY TO THE RETURNING SOLDIERS—AND OURSELVES.

The war has wrought tremendous and far-reaching changes in American character and American thought. It has been a great awakener to duty; not alone to the great outstanding duties of raising billions for the Allies, of creating an army out of nothing, of depriving ourselves of food so that Europe might not starve. These were big duties, unselfishly performed.

With the coming of peace there has come, too, a realization of the smaller, but none the less important, duties we owe ourselves. One of the greatest of these is being pointed out by the United States Public Health Service, and backed up by the Secretary of the Treasury, the Secretaries of War and the Navy. It is the duty of clearing the nation from vice diseases, which war demonstrated to us all were the prime causes of inefficiency within the nation.

Before the war it would hardly have been possible for the newspapers to discuss such a theme as venereal disease; the narrow, short-sighted view was that such a subject was shocking, immodest, disgusting, not fit to be discussed. The result has been that ignorance of the extent to which these venereal diseases were menacing the nation has allowed them to thrive and multiply until, when, for the first time in our history, millions of our young men were forced to submit to expert medical examination, the percentage of men found to be infected with one or the other of these diseases was appalling.

Of the first million, 30,000 had a venereal disease, when they reported from camp. The percentage by states varied from 0.59 per cent of the boys from Oregon to 8.90 per cent of those from Florida. It was estimated that five-sixths of all the venereal disease in the army was brought there from civil life.

Such revelations as this add terrific poignancy to President Wilson's grave note of warning:

"It is not an army we have to make fit; it is a nation."

To know the truth about communicable diseases is to be able to guard against them; to lessen them; to control them. That has proved to be true of tuberculosis,

of measles, of smallpox; of all the communicable diseases.

So we must all come to realize that the venereal diseases are highly communicable. They are primarily diseases of vice, spread mainly through prostitution, but they are also communicable by innocent means.

The United States Public Health Service, under Surgeon General Rupert Blue, is making a nation-wide fight for the cleanliness of American communities. Prostitution is being suppressed; laws requiring the reporting of venereal diseases, just as other communicable diseases are reported, are being passed by many states. Clinics for the skilled treatment of venereal diseases are being established.

In this work, which has for its object a clean America, every citizen must help in his single strength. The false modesty which has prevented a free discussion of this menace to the nation must be brushed aside, so that everyone may know and realize the danger to be fought against.

Never again can we as individual citizens be content with an attitude of indifference toward such a subject as this. The war has opened our eyes; we must keep them open until the danger is past.

WATERWORKS OPERATION: RESERVOIR MAINTENANCE

Investigating Leakage from Reservoirs—Causes of Leakage—Locating Leaks—Stopping Leaks by Use of Cement, Asphalt, Clay, Etc.

Water may be lost from a reservoir through both evaporation and leakage. This loss is objectionable in that it diminishes the amount of water available; but leakage may be a serious matter in that it may increase and result in the final destruction of or serious damage to the reservoir. A certain amount of evaporation is unavoidable except by completely roofing over a reservoir, and this is financially practicable for small reservoirs only. There are few if any reservoirs from which there is not at least a small amount of loss by leakage or seepage, and in some cases this loss through the floor or containing basin of the reservoir is very considerable.

INVESTIGATING LEAKAGE.

The existence of an appreciable amount of leakage is generally learned in one of two ways, either by observing the escape of the water from the ground outside of the reservoir or below the dam, or by noting that the surface of the water, with all outlets closed perfectly tight, falls more rapidly than can be accounted for by evaporation. Every superintendent should use both of these methods to determine whether any leakage exists, especially during the first year or two after a reservoir is put into service. Reservoirs have been known to suffer considerable damage from leakage several years after they were constructed, but it is believed that a certain amount of leakage existed from the beginning, and gradually increased until the final catastrophe.

For studying the falling of the water surface, it is necessary to choose a time, if such can be found, when it will be possible to entirely close the inlet and outlet valves during a period of at least 24 hours. If the reservoir is a distributing reservoir, it may be possible to keep up the pressure by operating the pumps continuously; or to by-pass the reservoir if the supply comes by gravity from a higher source, using a pressure regulator to prevent too high pressure in the distribution system, if this should be neccessary. If this is not practicable, a meter capable of measuring the entire consumption of the city should be placed on the outlet of the reservoir. It should be tested for precision just before such use, and even then there is a possibility of an error of one or two per cent. By making the investigation for leakage during the winter time, when the surface of the reservoir is entirely covered with ice, the factor of evaporation may be practically eliminated.

With the outlet and inlet valves closed tight (they should be carefully examined to determine that no water passes through them), falling of the reservoir surface should be noted carefully by use of a hook gauge, which may be located in the gate house or other convenient point. In the case especially of a large reservoir, the investigation may be complicated by the entrance into the reservoir of the discharge from springs either above or below the water surface. The existence of such springs is generally known to the observant superintendent; the presence of those below the surface, except where the water is quite deep, being generally indicated when ice first forms in winter by the failure of the ice to freeze immediately above such submerged springs as quickly as it does at other points in the vicinity. When the reservoir continues to discharge through a meter on the outlet line, the difference between the measured discharge and the amount that has left the reservoir as calculated from the fall in reservoir surface, is loss by leakage and evaporation.

For determining the amount of loss by evaporation, an evaporation pan is believed to be the most reliable appliance to use. This consists of a box of wood lined with tin or other metal to make it waterproof, which is anchored to float near the middle of the reservoir, and which is filled with water until it settles as deep as may be without the risk of water being splashed into it from outside. Either a small hook gauge or a flat scale graduated to sixteenths of an inch or finer, set at an angle of say 30° with the horizontal, is attached inside the pan for reading the amount by which the surface falls due to evaporation. It is believed that the amount of evaporation from such a pan is practically the same as that from the reservoir in which it floats.

Even more definite information concerning leakage can often be obtained by careful inspection of the vicinity around or below the reservoir (embracing all points lower than the surface of the water in the reservoir), for the emergence of water that is escaping from the reservoir. This is especially important in that such springs indicate either large amounts of leakage or leakage concentrated in definite channels, either of which is much more threatening to the safety of the dam than a general seepage and exuding of the water. While the reservoir is being filled for the first time (which filling should be done slowly, occupying several days for a small reservoir and several weeks for a large one), careful inspection should be made of all points where leakage of the reservoir water could possibly have an outlet; and at the first appearance of leakage investigation should be made, the inflow of water being stopped temporarily if conditions appear to be serious.

On the appearance of such leakage, careful inspection should be made to determine some of the conditions under which it is taking place. A small basin should be dug around the leakage outlet (or built around it if it should be of rock) in which the escaping water may collect to sufficient depth to permit obtaining samples without stirring up deposits in the bottom. After the flow into and out of this small basin has become established, it should be noted whether the water as it emerges carries any suspended matter, and the nature of this matter should be determined by carefully collecting a sample in a large size test-tube, a clear glass, etc. If

the water runs perfectly clear, there is apparently no removal of earthy matter by the escaping water, and the leak is not enlarging. It is possible that the water is dissolving lime from limestone formation under the dam or in its masonry, or dissolving mortar in the masonry, and this can generally be determined by a careful comparison of the chemical analyses of the escaping water and of that in the reservoir.

A careful investigation should have been made of the land below the reservoir to note the existence of springs prior to the filling of the reservoir, and the chemical composition of the water from any such springs should be determined, as well as the quantity of discharge. If the quantity or quality of the water discharged by such springs after filling the reservoir differs from that prior to such filling, the reason should be investigated.

All springs or leakage outlets should be watched carefully and observation made of them at frequent intervals for several months after the reservoir is put into service. If the quantity does not increase and there is no indication of the removal of either earthy matter or mineral matter, the desirability of finding and stopping the leakage would seem to rest chiefly upon the advantages of conserving the supply.

The escaping water may travel through crevices in the rock lying under the dam or at its ends, or through joints in the masonry in case of a masonry dam, or by seepage through an earthen embankment, or by seepage under such embankment through the natural soil. Which it is in any given case can generally be determined quite readily by the known conditions as to geological conditions and the construction and nature of the dam.

LOCATING LEAKS.

The stopping of leakage is generally a most difficult matter, and the exact method to be employed will differ in almost every case. There are certain general principles, however, which can be suggested and certain details of procedure that may be of service.

It is first necessary to locate the point at which the water escapes from the reservoir. (There is probably no conceivable condition under which reservoir leakage can be stopped at its lower or outlet end.) Since the point of escape of the water is always beneath the water of the reservoir, the escape of the water cannot be observed directly except possibly by use of a diver. In the case of a masonry dam, the leakage will generally be either in one of a number of faulty joints or cracks that may appear in the back, or through a large number of joints that are more or less porous and show no visible cracks. In the case of a concrete dam it may be through the concrete generally. It is practicable at comparatively small expense to render exposed masonry surfaces watertight, and it will generally be cheaper and more satisfactory to waterproof all suspected places than to endeavor to locate the exact areas at fault. If the leakage is found escaping under or below the toe of the dam, it probably is taking place through the rock or other material on which the dam rests. The exact point of escape, in such case, can sometimes be determined by spreading a thin layer of clay or other fine-grain soil over the exposed rock at the bottom of the reservoir, then filling the reservoir very slowly so as not to disturb this layer (or the layer may be formed without emptying the reservoir, by throwing earth into it from boats); then drawing the water down until it stands only two or three feet deep over the suspected rock bottom, and when it is clear, looking for indications in the thin clay cover of leakage into the rock, which leakage will have carried with it the clay immediately above and around the opening.

If the bottom of the reservoir is covered with gravel or sand, or other porous material, the probability is that seepage takes place through large areas of this material and the location of such areas is extremely difficult unless the leakage is large.

Where there is a considerable amount of leakage concentrated at one or more points, these may sometimes be located by the following method: A long tube, such as a rain-water leader or fire hose, of a length a little less than the depth of the water, is provided at top with a funnel and is attached to the side of a large boat or scow which is used to carry clay or similar fine-grain material. The scow is moved slowly over the suspected area and clay is meantime shoveled into the funnel and discharged at the bottom of the reservoir. An observer follows behind the scow and examines the bottom, using a water telescope if necessary (this is a tube the lower end of which is kept below the surface of the water and the upper end closed except for a small opening through which the observer looks, the tube eliminating the reflected light which interferes with looking into the water). At any point where water is escaping in any volume, the fine clay will be carried with it and the water will clear itself much more rapidly than at points where such clearing must depend upon the natural sedimentation of the clay. Any appreciable leakage through crevices in the more or less vertical faces of the rock around the sides of the reservoir can frequently be located in the same way.

While clay is being applied in the manner just described, inspection should be continued of the outlets of the leakage, if such are known, and the exact time of appearance of suspended matter in the leakage water should be made known, since it indicates that the clay deposited has passed under or through the dam. Allowance being made for the length of time probably required for water to pass under or through the dam, it is probable that the leakage is occurring at the point where clay was being discharged at such interval of time prior to the appearance of sediment in the outflow. This suggests another method of locating leakage, namely that of discharging through a tube, at points near the bottom of the reservoir or the back of the dam, water highly colored with aniline dyes, and noting the time of appearance of such color in the water escaping below the dam.

STOPPING LEAKAGE.

For stopping leakage in masonry or through seamy or porous rock, reliance should never be placed upon clay in any form. The writer knows numerous instances where carefully planned efforts have been made to use clay for this purpose, but has yet to learn of one that was successful.

If the crack or opening is at all large, it should be filled with Portland cement mortar. After the mortar has set it may then be made more water-tight by washing it with cement and water of creamy consistency, the mortar and surrounding rock first being thoroughly wet. After this wash has dried and the cement set, it should be wet again and a second wash of cream of cement applied. This treatment over the entire wetted face of a masonry dam, especially a concrete dam, will generally add to its tightness. In fact, if well done, it will generally make any masonry dam as nearly tight as a dam can be; except that temperature expansion and contraction may open up cracks in the face.

Where temperature cracks occur, greater tightness can generally be obtained by covering the entire surface with a layer of asphalt made liquid by heat, applied when the masonry itself is warm, either by carrying on the work only after several hours of summer sunshine have

warmed it, or after it has been heated by the application of a blow-torch or some similar contrivance. In using a blow-torch, however, care must be taken not to overheat the rock so as to cause it to flake off or otherwise disintegrate at the surface. (Such treatment of a reservoir wall in St. Louis with three coats of asphalt was done by contract at a cost of 3.74 cents per square foot.) Where the cracks through which leakage occurs are in the rock in the sides or bottom of the reservoir, there can be no expansion or contraction, and the use of mortar and cement wash will generally be effective.

Water escaping through an embankment may pass as a general seepage, or it may be concentrated in one or more channels. In the latter case the leakage is generally due to the existence of sticks or other foreign matters in the soil, to holes bored by muskrats, crayfish or other water animals; or the channel may follow the outside of a pipe or other body that extends continuously through the embankment. Most earth dams have been constructed with a core wall calculated to prevent water escaping through the dam, even though it may enter the upper face of it, and such wall will generally serve to limit the burrowing of animals.

Where there is no core wall, and there is general seepage, it may be necessary to line the entire upper face of the dam with some waterproofing material. Clay puddle may be used for this purpose, but preference in recent years has been for concrete. With a thoroughly compacted or settled bank, the face being dressed down to a uniform surface from which all soil that is water-soaken or otherwise soft has been removed, a four-inch thickness of concrete will generally suffice for a waterproof lining. It is not necessary to describe the construction of such lining, except to say that all the precautions necessary for securing waterproof concrete should be taken; that the concrete should be anchored at the bottom by a sufficiently strong toe wall or other structure to prevent its sliding down the bank; and that in most cases it is desirable to use expansion joints running at intervals up the slope, but horizontal joints are not necessary.

Where the seepage occurs generally over a porous bottom, the remedy is much more difficult. If the area is small, concrete is probably the best remedy; but for large areas it would possibly be impracticably expensive. Clay or other fine-grain soil may be used for preventing seepage. This can frequently be applied by casting it at a uniform rate from a scow drawn slowly back and forth across the reservoir. It may require two, three or more applications to secure tightness in this way. If the first application, for instance, practically stops the seepage over two-thirds of the area, small areas here and there not receiving sufficient clay, the rate of seepage through these small areas will become greater, and on the second application of clay there will be slight currents which will tend to draw the clay to the desired points rather than permit it to settle over areas already sufficiently covered. This method is expensive for a large reservoir, and, instead, it may be possible to secure the result by casting or sluicing clay or other fine earth into the stream or streams feeding the reservoir, especially if this is done when water is flowing over the dam or the waste weir so that there is a current entirely across the reservoir to carry the clay to all parts of it. It is difficult, however, to secure a general distribution of the clay by this method.

Where the bottom of the reservoir is not already of material at least as fine as rather fine sand, this method will probably prove disappointing, since the clay will be carried into and through the pores of the soil. In such case it may be desirable to build up a bed for retaining the clay, sand being perhaps the best material to use for this purpose. The sand should be spread over the entire area with a minimum thickness of at least an eighth of an inch, and the clay may then be applied as before described. In fact, if the water naturally carries clay after rain storms, the application of the sand alone may be sufficient, the clay naturally provided by storm run-offs in time filling up the pores in the sand layer.

In one case of a large reservoir, a large part of the bottom of which was of quite porous material, it was proposed to cover such material with a thin layer of sheet asphalt mixture, laid and rolled as is done in paving highways. This would probably require a more or less rough grading so as to remove bumps and hollows, and rolling with a heavy roller so as to furnish a stable support for the asphalt lining. So far as we know this method of preventing leakage has never been carried out.

Where it is impracticable to adopt any method for making the bottom of the reservoir impervious, the amount of water escaping may be greatly diminished and danger of rupture eliminated by filling above the dam so as to give it a long, flat slope, thus increasing the distance through which the water at the greater depths must travel in order to escape below the dam. This may or may not be more expensive than methods described above, depending upon local conditions. It may be possible to supply the earth backing by hydraulicking the earth into the reservoir from the higher lands at the end of the dam.

Another method of preventing seepage through the ground under the dam is by means of a cut-off wall of sheet piling, concrete or clay puddle. If there is rock within ten or fifteen feet below the reservoir bottom, a concrete all built on such rock and thoroughly bonded to it will prevent such seepage. If there is clay or other impervious material within thirty or forty feet depth, a cut-off wall of tongued-and-grooved sheet piling driven into such impervious stratum will serve the purpose. In any case, the cut-off wall should be placed close to the upper toe of the dam and the face of the dam below the cut-off wall made impervious by the use of clay or concrete as described above.

In general, it may be said that only cement or washes of asphalt, alum or other special waterproofing materials can be used in connection with masonry or rock. Clay can be used for waterproofing soil, but only when applied to that whose pores are very fine. Where the soil is gravelly or composed of coarse grains of any nature, clay is worthless. In such cases a mixture of clay and sand also is of little permanent value; sand alone is much better for use than clay, for although it may not make so tight a dam, it is less likely to be removed by the escaping water. The only plan that is likely to give permanent results with very porous soil is to apply over the gravel or over the coarse-grain material a fine gravel or coarse sand that cannot be carried into the interstices of the coarser material; then, on top of this, place a layer of finer material which cannot pass through the interstices of that last applied, and so on, finally applying a layer of fine sand. If this is all thoroughly rolled or otherwise compacted (it may be applied to advantage while there is a foot or two of water in the reservoir, thus securing both a natural segregation of particle and "water-tamping" which results in a compact mass), clay may then be applied to complete the waterproofing; or, as suggested above, it may be left to nature to supply the fine material during successful freshets unless the stream supplying the reservoir remains clear at all times.

(To be continued)

The WEEK'S NEWS

Oregon's Proposed Highway Expenditures—Denver's City-Owned Waterworks—Complete Metering for Newport, R. I.—Ontario Hydro-Electric Commission—New York Has Aerial Police Force—U. S. Helps in Cleaning Up Vice—Capital Issues Committee Suspends Work—"Single Tax" Defeated in California—Buffalo to Decide Again on Higher Fares—Senate Refuses Aid for Hudson Tunnel—Government Housing Work to Stop—Bad Housing in Philadelphia.

ROADS AND PAVEMENTS

City Must Pay for Streets Without Special Benefit.

Philadelphia, Pa.—The city must pay for paving streets where it is shown the improvement is for the general good and no special benefit is derived by the owners of abutting property, according to a decision filed by Judge Wessel in the Common Pleas Court. The case was that of the city, to the use of the McNichol Paving and Construction Company, against two owners of large tracts of farm land, which were included in the several ordinances of councils and the contracts between the city and the different railroads providing for the port development, abolition of grade crossings and the general improvements in South Philadelphia. In this particular case the city and railroads must assume the expense of paving this newly opened section. The city had filed liens against the land owned by the defendants for work and material furnished in paving the streets through the land, amounting in the aggregate to $3,453.06. In resisting payment it was contended the work was a public improvement for the good of the general public and there was no special benefit to the properties. Judge Wessel upholds this contention and says, in part:

In the present case an examination of the facts, in which the per-foot frontage rule is based, discloses at once the want of analogy between large farms with single occupants or owners, or wild or untenanted land in the country, and the small lots of a crowded street in a populous town. The legislature, therefore, made a mistake in fixing such a burden upon the lands along the route of this avenue. It is, in fact, nothing more than a law to coerce certain land owners to pay for a public improvement in which their interest is no greater, and as to some of them not so great, as that of many others who pay nothing; and it offends against the clear intent and spirit of the bill of rights. We, therefore, conclude that if the defendants can satisfy the jury that the paving was merely a part of a general plan of improvement for the public good and resulted in no special benefit to the defendants' property, they should not be made to pay any part of the amount involved in this lien. This renders unnecessary the consideration, at this time, of the second question raised by the affidavit of defense. The rule for judgment for want of a sufficient affidavit of defense is discharged.

Road Renamed for Pershing.

Jefferson City, Mo.—In order to show its pride in the fact that General John J. Pershing is a Missourian, the section of the "Pike's Peak—Ocean-to-Ocean Highway" passing through the state has been rechristened "Pershing's Transport Route." The road passes by the old Pershing home at Laclede, Mo. Both as a "reconstruction" measure, to furnish jobs for returning Missouri soldiers who may want them, and as a state memorial to the commander of the American forces in France, plans are under way for the early hard surfacing and reconstruction of this highway.

To Spend $3,525,200 for Oregon Roads.

Salem, Ore.—Highway construction calling for an expenditure totaling $3,525,200 is contemplated in the annual road program adopted by the state highway commission, and it is estimated that it will furnish employment to more than three thousand men this year. Contracts will probably be awarded for several of the projects at the January meeting of the commission, but the bulk of them will be awarded later in the year. The funds for the construction of the projects embraced in the program will come from the $6,000,000 hard-surfacing fund, the quarter mill tax fund and the automobile fund. Approximately $2,790,200 will come from the first named fund, it is estimated, and the remainder, $735,000, from the other two. Projects to be constructed with funds from the federal forest and post road funds are not included in the program. Plans for the expenditure of this money will be formulated in the near future by the commission. The Aurora-Salem project will be built with such funds, and the commission has decided to commence construction work upon it as soon as the weather will permit. The highway engineer has been instructed to immediately advertise for bids for the construction of the Hood River-Mosier section of the Columbia river highway, and the contract for it will no doubt be awarded at the next meeting of the commission. Fully one year will be required to build this link, and it will provide employment for several hundred men.

WATER SUPPLY

City Increases Water Rates.

Middletown, O.—The city commission has passed an ordinance increasing the water rates. The new rates will be as follows: $1.35 per cubic foot for from 1,000 to 5,000; $1.10 per cubic foot for from 5,000 to 10,000; 70c per cubic foot for all over 10,000 cubic feet. A discount of 10 per cent will be allowed for all bills paid before the 20th of the month. The water works records show the consumers may be divided as follows: Those using 1,000 cubic feet, 1,406; 2,000 cubic feet, 624; 3,000 cubic feet, 377; 4,000 cubic feet, 184; 5,000 cubic feet, 82; 6,000 cubic feet, 63; 7,000 cubic feet, 39; 8,000 cubic feet, 32; 9,000 cubic feet, 13, and over 10,000 cubic feet, 159. During the last quarter, under the old rates, receipts amounted to $34,239, while under the new rate for this same period the receipts would have amounted to $48,231, an increase of $13,992.

Denver's Waterworks Under City Ownership.

Denver, Colo.—The city has now been in actual possession of its municipal water plant for two months, the formal transfer having taken place on November 1. The total amount paid for the plant was $13,922,836.60, or $47,163.40 less than the amount voted by the people. From November 1 to November 16, the water commission took in $168,633.52 on the first half of water rents for the ensuing year. Several important changes have occurred in connection with the plant since the city took it over. The water board submitted its plan for 1919 extensions to the Denver County Council of Defense, which approved them and forwarded its recommendations to the capital issues committee at Washington. These plans include extension of the plant to accommodate the General Army Hospital No. 21 at Aurora and the Union Stock Yards district, the rapid expansion of which demands greater fire protection. These extensions, both of which, it is estimated, can be constructed for $619,000, will also serve to increase service to the general consumer, according to Barton Lowther, chief engineer and superintendent. The city coal department, on November 1, took over the work of supplying the water plant's seven pumping stations with coal. The Denver Union Water company paid $5 a ton for coal used at these plants, but the municipal coal department will furnish the coal, the estimated amount of which is 10,000 tons annually at $3.15 per ton. These are, of course, war prices.

The total tonnage furnished by the coal department to city institutions during the year ending September 1 was 10,583. The acquisition of the water plant will, therefore, double the total volume of coal used by the city and, without considering domestic consumption at all, will make the continuation of the city coal department as a permanent institution a desirable feature of city government. The personnel of the water plant's operating force was not disturbed, except as to a few persons in managerial capacity, the water commission recognizing that the successful operation of the plant requires skilled help. The city is exchanging municipal water bonds at four and one-half per cent for bonds of the South Platte Reservoir and Irrigation company at five per cent, the total amounting to $3,112,000. These bonds will not be retired, as they have a certain voting power and the city attorney's office has deemed it advisable to continue the various boards and directorships of the old company for legal reasons. City officials succeeded water company officials on all these boards. The financial statement, upon which was determined the amount of bonds delivered to the Denver Union Water company, is as follows:

Master's valuation	$13,415,899.00
Additions and betterments	1,045,462.80
	$14,461,361.80
Deduct depreciation (4½ years at $140,000 a year)	$ 630,000.00
	$13,831,361.80
Deduct outstanding South Platte bonds	3,112,000.00
	$10,719,361.80
Add difference between appraiser's valuation of Class T property, viz., $266,160.80, and Master's report of $174,686, amounting to	91,474.80
	$10,810,836.60

Commission Orders Complete Metering.

Newport, R. I.—The state public utilities commission has handed down a decision directing the Newport Water Works to proceed "as soon as possible" to meter all city service pipes in Newport. The commission also directs the company, within four months after the meter installation is complete, to file with it for allowance a new schedule of rates, designed to produce net revenue substantially equal to that received at present. Decision by the commission comes upon the complaints of the city of Newport and of consumers against the Newport Water Works, hearing upon which began in August, 1913, and ended in January, 1915. The decision says that the company must submit "a new schedule of hydrant, fixture and meter rates, and special rates, so adjusted as to produce a net revenue substantially equal to that received by the company under the present schedule of rates. Such new schedule shall provide that meters may be installed at the request of either the customer or the company, and that the company shall bear the expense of the meters. Such new schedule may provide that the company shall be required to recognize as a customer only the owner of the land, or the lessee of the entire premises, also that all fixture rates and a minimum charge for metered service shall be payable annually in advance."

STREET LIGHTING AND POWER

Work of Canadian Provincial Hydro-Electric Commission.

Toronto, Ont.—E. R. C. Clarkson, who was appointed by the Ontario Government to investigate the operations of the Provincial Hydro-Electric Commission has submitted a report up to October, 1917, in which he clearly vindicates the commission and justifies public ownership of public utilities, when controlled by such men as Sir Adam Beck and his colleagues. Referring to the Niagara power system Mr. Clarkson says: "To October 31, 1917, the rates collected by the commission from forty-one municipalities had been sufficient not only to meet operating cost and reserves for renewals, contingencies and sinking fund, but to leave a surplus of $391,551.94. This amount has been retained by the commission either as security for the payment of sinking fund charges or with a view to moderation in the rates charged to the municipalities which contributed. The rates collected from the remaining sixty-eight municipalities were insufficient by $204,822.14 to pay operating expenses, and also meet the reserves for renewals and contingencies in respect of the proportion of capital cost of works and lines to be operated by them."

New Power Plant for Scotch City.

Glasgow, Scotland.—The increased use of electricity for power and heating has made it necessary for the corporation of the city of Glasgow to build an additional electrical power plant. This new plant is located at Dalmarnock, Scotland, and covers 45 acres on the right bank of the River Clyde. The site was purchased for $315,000. In August, 1914, offers were accepted for constructing the inlet and outlet water culverts and the foundations, and this work, which cost $403,919, was finished at the end of 1916. It had been agreed to suspend further operations during the war, but owing to the great increase in the demand for electric power for work of national importance this decision was rescinded. In the summer of 1916 contracts to a total amount of $583,980 were fixed for reinforced concrete buildings and brick and mason work, constituting one-half of the generating station, one-half of the switch house, two boiler houses, and complete coal storage. Since April, 1917, orders have been placed for four 25,000 horsepower turbo-alternators and condensing plant, together with eight boilers and accessories necessary for the complete equipment of one boiler house, also for a plant for the rapid and economical handling of an amount of coal amply sufficient for the maximum requirements of the station. There are railway sidings for the delivery of the coal, and the store, which covers 2½ acres, will accommodate 60,000 tons of coal. The turbine room, a two-story structure 230 feet long by 75 feet wide, is the main building. On the north side will be two boiler houses, three stories in height, each containing eight boilers. On the south side of the turbine room the switch house is being erected, and it will contain the main switch gear, as well as 20,000-volt transformers. The switch house, being a separate building, the staff will perform their duties undisturbed by the noise of rotating machinery. There will be a workshop alongside the first boiler house, and there a crane for lifting heavy machinery will run from over the railway and connect with the turbine room crane. The machinery and accessories on order for the turbine room, boiler and switch houses, etc., will cost $4,185,190.

FIRE AND POLICE

No Increased Pay for "Inactive" Sergeants.

Yonkers, N. Y.—Only the patrolmen in the police bureau, and the firemen of the three grades will receive the $150 annual increase in salary, which has been provided for in the budget of the public safety department, approved by the board of estimate. Delegations of both police and firemen had waited upon commissioner O'Keefe, and asked that their salaries be increased at least $250 a year. That, however, was before the armistice, when it appeared as though the demands of the uniformed men would have to be granted in order to keep them from resigning, to go into more profitable war-industry occupations. The estimate board discussed the probability that the cost of living might be reduced sufficiently to enable the men to live comfortably on their salaries. They finally decided on the $150 increase. It was originally intended to include the police sergeants in the pay increase, but during the discussion among the members of the board of estimate, the point was brought out that not in six years has a sergeant "turned in" a patrolman for even the most trivial infraction of rules. From this the board took the attitude that the sergeants

could not have displayed any extraordinary vigilance in making their rounds, and that therefore they were not entitled to much consideration in taking up the question of salaries. The sergeants receive $1,650 a year, and the patrolman $1,400. The average pay of the ordinary fireman is $1,300

Fire Sweeps Business District.

Burlington, N. C.—Damage estimated at $250,000 resulted from fire in the business district here which destroyed three concerns and partly burned the buildings and stocks of several others. The Greensboro fire department responded to a call for assistance, but almost the entire business block was consumed before it arrived. The Greenboro fire engine, on it way to Burlington, turned over on the road at Elon College. Other apparatus was forwarded by railroad. However, the water pressure at Burlington was exhausted and sufficient water was not available to throw a stream to the top of the burning buildings. Without an engine it was impossible to stop the spread of the flames. The fire started in the center of the block on Main street, and spread east and west. One fifty thousand-gallon tank and a small pump was all the fighting apparatus available.

Aerial Police for New York City.

New York, N. Y.—Police commissioner Enright has organized an aviation section in the police department with Colonel Jefferson De Mont Thompson as its head. New York is said to be the first city in the world to have a regular aviation section connected with its police department. Alan R. Hawley, president of the Aero Club of America, in speaking of the new section, said: "The fundamental importance of the aviation section is quickly appreciated when the many duties of the police department are considered. The work of the aviators in connection with directing the protection of communities surrounding Morgan, N. J., during the recent catastrophe, when the fire threatened to ignite tons of TNT, which might have caused the destruction of the subways and buildings in New York City, emphasized the necessity of having aviators available for such emergencies."

Wiping Out the "Red Light" Districts.

Washington, D. C.—The report of the Law Enforcement Division of the Commission on Training Camp Activities for the week ending November 27 gives a good indication of the progress that is being made throughout the nation in combating the spread of venereal diseases and the suppression of prostitution. In Chester, Pa., a raid resulted in the arrest of 42 men and women and the closing of a number of resorts. In Denver the chief of police has ordered all the known prostitutes listed. In Lafayette, La., the "red light" district was raided and closed. McLaurin, Miss., made a raid on resorts and arrested two women. In Oklahoma City, Okla., a force of volunteer police has been organized to look after the hotels and rooming houses. In San Francisco during the influenza epidemic keepers of houses of ill repute attempted to re-open; raids resulted in the arrest of 34 women and 8 men. In Waco, Tex., a raid on a number of hotels caused the arrest and detention of 20 men and women. During the week two "red light" districts were closed, one each in Opelousas and Lafayette, La. Seven houses of prostitution were closed, four in New Orleans and three in Providence, R. I. There were 421 arrests for prostitution, of which Reading, Pa., furnished the highest number, 108; Chester, Pa., was second with 42.

GOVERNMENT AND FINANCE

Capital Issues Committee Suspend Work.

Washington, D. C.—The Capital Issues Committee, the Government' war agency for the suppression of unessential security issues, suspended its activities December 31 and will remain inactive until dissolved, unless called back into service by developments. Accompanying the announcement were warnings to the public, both from the committee and secretary Glass, of the necessity for continued strict economy and against worthless securities. The committee stated its intention of making a supplementary report to Congress recommending a law to prevent impositions upon the investing public, and secretary Glass said he would ask the present Congress to enact such legislation immediately. To illustrate the extent of the menace, the committee said schools were being established to drill salesmen in the art of fraudulent promotion. Secretary Glass issued a statement as follows: "The demand of the Capital Issues Committee to suspend its activities December 31 should not be interpreted by the business public as a warrant for any expenditure of capital for needless or unwise purposes, whether public or private in their nature. Should it become apparent that voluntary restraints are not being exercised so as to prevent the misuse of capital I shall request the committee to resume its control. My chief misgiving in accepting the action of the committee arises out of the need the committee has frequently expressed and the importance which had become increasingly obvious, of protecting the public investor against the flood of worthless or doubtful securities which threaten the market when the restrictions are removed, and present conditions emphasize the importance of obtaining emergency legislation as speedily as possible so as to be able to cope effectively with this evil. The government not only should protect itself as to future bond issues but, as well, owes a duty to the millions of Liberty Bond buyers to restrain reckless and fraudulent promoters, particularly at this time. I intend to ask Congress immediately for legislation that will check the traffic in worthless securities while imposing no undue restrictions upon the financing of legitimate business, and shall urge that it be made effective before the close of the present session. Meantime, it may become necessary before such legislation is passed to reassemble the committee for the purpose of resuming its functions." Chairman Hamlin, in a statement, pointed out that it is "imperative that capital should be saved and removal of the restraining influence exerted by the committee during its existence should not be construed as approval of the financing of unnecessary public projects or private enterprises of doubtful merit. On the contrary, the financial needs of the Government and the large capital requirements of the railroads and for the readjustment of American industries to a peace basis compel strict economy in the use of new capital."

Reconstruction Committee Appointed.

St. Louis, Mo.—Mayor Henry W. Kiel has created a Municipal Reconstruction Committee which will act in an advisory capacity to the municipal administration in the solution of after-the-war problems. Clarence H. Howard, president Commonwealth Steel Co., has been appointed to the committee.

Single Tax Plan Defeated.

Sacramento, Cal.—The proposed "single tax" amendment submitted at the recent elections was defeated throughout the state by a total vote of 360,334 to 118,088. The 1916 vote on the same question stood 576,533 to 260,332. "After spending over $100,000 on this election," figured the real estate interests, "the single tax strength sank from one in two to one in three."

Secretary Baker Asks Hastened Construction Work.

Washington, D. C.—Government officials are inaugurating a campaign to have states, counties, and municipalities begin all possible construction work at once in order to furnish work for returned soldiers and sailors, as the United States Employment Service and labor representatives in the War Industries Board expect a surplus of labor and a shortage of jobs during the late winter. Newton D. Baker, Secretary of War and chairman of the Council of National Defence, has wired all State Defence Councils as follows: "Reemployment of discharged soldiers, sailors, and war workers is one of the most important tasks now before the country. We strongly urge that, in sections where surplus labor exists, all public improve-

ments be advanced in order to absorb labor. We ask that you use all influence with state, county and municipal authorities to this end. Preliminary steps should be taken immediately in order that necessary authority may be secured in time, for operations upon opening of construction period." Washington officials will do everything possible to have legislatures of the various states provide funds for immediate public improvements, and to get private construction work under way. What is expected to result in immediate impetus for building work is the order sent out by Bernard M. Baruch from Washington, as follows: "Effective January 1, the rules, regulations and directions of every nature whatsoever issued by the priorities division of the War Industries Board are hereby canceled, and all pledges heretofore made on the suggestion or request of the said priorities division are hereby revoked.

Wants State to Regulate Haphazard Tax Collection.

Albany, N. Y.—A more stringent check on the collection of approximately $70,000,000 of revenue gathered annually by upwards of five thousand different state and local divisions and agencies is to be recommended to the Legislature by state controller Travis. In his arraignment of the present system, the controller insists that it is manifestly as much his duty to audit the revenues of the State as the expenditures because irregularities occur more frequently in the former than in the latter. "Many public officials who collect these revenues are neither business men nor accountants," said the comptroller. "This condition is disclosed particularly in the work of the municipal accounts bureau in charge of the auditing of the finances of over fifteen hundred municipalities of the state, and while numerous cases of shortages have been discovered, it is only just to say that the most of them have been the result of carelessness and ignorance of the proper laws and of accounting methods, rather than from deliberate dishonesty."

Advisory Committee to Study State Economy.

Sacramento, Cal.—Thorough investigation of the business affairs of the state of California, with a view to a reduction in expenses if it can be done without impairment of service and efficiency, is contemplated by Governor William D. Stephens in a statement, in which he announces a committee to handle the details. The committee is composed of the following named: A. E. Boynton, president of the Commonwealth Club of San Francisco; Herbert W. Clark, director Taxpayers' Association; Frank P. Flint, former United States senator; Dr. John R. Haynes, Los Angeles; Percy V. Long, San Francisco; Lee A. Phillips, Los Angeles; U. S. Webb, attorney general; John S. Chambers, state controller; Marshall De Motte, Clyde A. Seavey and Edward A. Dickson, of the state board of control. The governor's statement says in part: "During the past few years California's government has been practically reconstructed. We have experienced a development along social, humanitarian and industrial lines which for so short a period surpasses the history of like achievement in any other state. But exactly the same results follow in governmental development as follows expansion in private business, and as in private business, after growth and development, we now must remove all extraneous expense and practice the strictest economy in carrying on the state's activities. If there be debris and structural staging, necessary to the work of building but unnecessary and expensive to proper maintenance, such non-essentials must now be removed. Necessarily in grappling with the big industrial, economic and social problems, governmental activities have grown up more or less independent of each other, with inevitable overlapping. What we want to know is the extent of this overlapping, and the possible saving to the people in cost of government without injury to the public service. With this idea in mind I am asking the committee to make a study of the problems and to report to the governor upon the following points: The statutes under which each department, bureau or commission is organized. The powers, duties and internal organizations, as provided by law and in fact exercised. To what extent powers and duties overlap and duplicate. Analysis and comparison of appropriations and expenditures. Recommendations."

TRAFFIC AND TRANSPORATION

Buffalo to Vote Again on Higher Fares.

Buffalo, N. Y.—The citizens must vote again on the question of paying a 6 or 7-cent fare to the International Railway, city council having re-enacted a previous resolution which allows the company to charge a 6-cent fare with 1-cent rebate slips until the determination of a just and reasonable rate by the Public Service Commission for the Second District. This action on the part of the council was made necessary by the filing of a referendum petition containing the names of more than 12,000 voters checked by the city clerk and representatives of the International Railway. March 25 has been fixed by the city council as the date for the next referendum. The question to be voted upon will be the same as before, namely, whether or not the action of the city council shall be repealed. By voting "yes" a voter opposes a higher rate of fare, and by voting "no" the vote favors the 6 or 7-cent fare. At the last referendum the vote was five to one against higher fares. Although an agreement was reached last month between the municipal authorities and representatives of the railway whereby all pending litigation would be dropped and the so-called service-at-cost plan into effect, no effort has been made by the council to enact a resolution toward accomplishing the plan. Such a resolution would also be subject to a referendum. No resolution can be enacted by the city council giving the railway the right to raise its fares, without a referendum vote of the people, if the proper referendum petitions are filed.

No U. S. Aid for Hudson Tunnel.

Washington, D. C.—Practically all hopes of obtaining federal aid for the proposed Hudson River vehicular tunnel from Jersey City to New York has been killed. After hearing the representatives of New Jersey and New York on the Calder bill, authorizing the Federal Government to participate in the cost, the Senate committee on interstate commerce voted against a favorable report on the bill. The committee's action was unanimous and was based on the conviction that the cost should be borne either by the two states or by private capital. There is a bill on the House side, introduced by Representative Eagan, similar in terms to the Calder bill. It is unlikely that in view of the Senate committee's action, it can be successfully pushed at this time. The friends of the bill in the Senate said that one of the factors which influenced the committee to act adversely was the agitation over Government ownership of utilities. It was declared that the state of mind at the Senate was unfavorable to anything that smacked of Government ownership. The Calder bill would authorize the National Government to join with New York and New Jersey in building the tunnel at a cost of $12,000,000. The star witness at the hearing was Major General George W. Goethals, who said he had passed on the engineering phases of the plan. In response to a query based on the issue whether the Federal Government should be made to pay any part of the improvement, General Goethals said that the tunnel would serve a distinct military value, and if it had been in existence during the emergency of the war period at the Port of New York, the Government could have expedited the handling of its transports. General Goethals also declared that the tunnel would expedite the handling of mails. The committee manifested its opposition to federal financing in numerous questions that were put to the representatives of the two states. General Goethals said that he had been called in to pass on the project by the Joint State Commission. He first passed on the question whether the two shores would be connected by bridge or tunnel. He decided against a bridge because it would be more or less an obstacle to navigation

and, if destroyed in time of war, would block navigation. A vehicular tunnel project would relieve congestion where a bridge would not, and fogs and ice would not be the terror to traffic that it now is. General Goethals said his plan provided for a tunnel forty-two feet in diameter, of concrete block construction, with two tiers, and of a width sufficient to allow three trucks to travel side by side and also providing a footpath. General Goethals said that a responsible contracting firm has estimated the cost, on the basis of wartime conditions, at $12,000,000, and that construction would take two years. The annual maintenance cost was placed at $125,000. "This tunnel," added the general, "will relieve congestion along the shore front and if the proposed port development with a large freight classification yard on the Jersey side is followed out it will bring material relief in lighterage and other river traffic that is now very much congested." It had been calculated, he said, that the cost would be paid back under an amortization plan within twenty years. E. W. Bloomingdale, chairman of the joint tunnel commission, in arguing for federal aid, justified it on the ground that the tunnel would be a continuation of the national highway system and an essential part of the federal mail routes. "You can say the same about a bridge over the Mississippi," said Senator Kellogg. "If we are to help with this project for the reason you state, why not help with the various other projects that are on the same level?" Mr. Bloomingdale proceeded to argue that the port of New York was more than a local affair; it is a national institution, surrounded by conditions of country-wide extent, that put it in a class by itself. Senator Kellogg retorted that the difference between New York and the cases he cited was a difference of degree only. Mr. Bloomingdale said that the federal road aid act, whereby the Federal Government contributed to state road upkeep in partnership with the states, furnished an anology which made the tunnel bill a reasonable proposition. The question of ownership also was brought up. It was explained that under the proposed plan, the ownership would rest with the two states and the Federal Government would possess perpetual rights for the movement of mails and for military purposes. Chairman Smith wanted to know if, when the cost was liquidated, the tunnel would be made a free public roadway. Mr. Bloomingdale was inclined to think it would. He cited the fact that the history of all toll roads and bridges shows that in due course they become free.

CITY PLANNING AND HOUSING

Senate Asks Stop to Government Housing.

Washington, D. C.—Suspension of work on all housing projects under construction for the Department of Labor's Housing Corporation, which are not 75 per cent completed, is provided for in a resolution adopted by the Senate. The resolution was agreed upon after Senator Lenroot of Wisconsin, a member of the Public Buildings and Lands Committee, which has been investigating the housing projects, charged in the Senate that testimony showed that a construction company of New York had made excessive profits on contracts and that contracts had been awarded by the corporation in violation of law. In addition to stopping work on projects in all parts of the country for housing war workers, the resolution would require the cancelling of all contracts for furniture for the houses and the return of all furniture in transit or delivered and unsold.

War Memorial Building for Toledo.

Toledo, O.—Toledo's memorial for its soldiers has taken definite form following a meeting of representative of some thirty civic, patriotic and fraternal organizations which had been called by council's memorial committee, Messrs. Charles D. Hoover, Harry M. Curtis and Cornelius C. Collins. Mayor Schreiber presided, and in stating the object of the meeting said that public sentiment had already crystalized on this subject to the extent of desiring a Memorial building, which shall be located upon the land now owned by the city and destined to become the civic center of Toledo. The mayor gave it as his judgment that the city should issue bonds for this project in the sum of $500,000, and that any additional amount needed should be raised by public subscription. This plan does not take into account the $250,000 voted several years ago by the county for the erection of a similar building in honor of those from Lucas County who had taken part in the wars of this country up to that time. In explanation of this stand, the mayor stated that he felt that the proposed memorial should be wholly within the control of the city, and that no question should ever arise that might be predicated upon joint city and county management of the building. Legislation upon the bond issue will be prepared by the mayor, for early action by council under the law by which $500,000 can be issued by the city in any one year, without a vote by the people. Prompt action will also be taken by the mayor, in naming a committee which shall be charged with the duty of securing popular subscriptions.

Expert Declares Philadelphia Housing Menace.

Philadelphia, Pa.—John Ihlder, secretary of the Philadelphia Housing Association charges that the division of housing and sanitation of the department of health and charities virtually had ceased to function since James F. McCrudden, the former chief, resigned some months ago. He said that widows working for a living for their families lost work on clothing for the Schuylkill Arsenal because officials there found housing conditions in certain parts of South Philadelphia so filthy that they considered them a menace to the soldiers. Mr. Ihlder exonerated Michael Kelly, the present acting chief, and said the blame rested on Dr. Wilmer Krusen, director of public health and charities. Mr. Kelly, according to Mr. Ihlder, holds down three jobs for a single salary and has his hands full. The trouble, according to the housing expert, lies in the fact that during all these months the division has been placed on a temporary rather than a permanent basis of organization. For that reason, he insists, the work in certain lines has gone completely to smash. As an illustration of the manner in which the falldown has been combated by the housing association, Mr. Ihlder exhibits photographs which show the condition before and after cleaning. This work, however, was performed by a contractor hired and paid by the housing association, he adds. Mr. Ihlder said, however, that as the result of a conference with the mayor, it was agreed to postpone the scheduled examination for a new chief of the division until after December 2, when the civil service had called for the applicants to appear. The reason for this postponement, Mr. Ihlder said, was that with experts being released from the Federal service there would be a better opportunity to get an expert in that line than at present. Letters were written by his association to various sanitation and housing experts and to municipal engineers, asking them to compete for the position. The only drawback he said, was that the salary should be $4,000 instead of $3,100, in order to be attractive enough to lure experts to compete for the position. Dealing with the matetr where the Federal authorities intervened and took away work on soldiers' clothing and uniforms, Mr. Ihlder referred particularly to a certain block of houses, which he said was characteristic. He said: "It has been neglected for a number of years and always was in a filthy condition. It became so bad after the thaw last spring that in a half dozen instances the rear walls fell down, although people were living there at that time. We made complains to the building inspection department and finally they demolished the half dozen in that condition. The others, forty-nine in number, are exceedingly bad. The rear alleys, as we can show by photographs, were littered with paper and refuse, and the condition was a menace to health. We expected by next spring, unless conditions were changed, the places would breed an epidemic. However, we had a contractor clean the places ourselves, and

even in its cleanly condition it is intolerable, because of the insanitary conditions of the houses, which affect the alleys." In one house of this block lived a widow with three children who obtained work on soldiers' clothing from the Arsenal. She kept her own home as neat as a pin in contrast to the other houses in the neighborhood. Officials from the Arsenal visited her, took a look at the surrounding houses in the block and took away from her the work she was doing. They said manufacture of clothing in such localities was a menace to the soldiers and could not be tolerated. Mr. Ihlder said in some cases which he cited, the houses had been neglected and on their list as dangerous to public health and comfort since 1914. The conditions under which shipworkers were housed here, Mr. Ihlder insisted, were disgraceful. Not only were they herded in rooms which provided insufficient accommodations, but in several cases beds were put in closets and men permitted to sleep there. "Here is an example," said Mr. Ihlder, showing a photgraph of the interior and exterior of a house. "It is a three-story house, and in one room on the third floor back five Hog Island workmen and a fourteen-year-old boy, the son of the family, sleep. It is barely sufficient for two persons to be lodged comfortably. Another place is a lodging house. This photograph shows the place lodges fifty men every night, and in it you see a picture of a bed placed in a dark closet. To show the increase and disposition of the complaints to the Division of Housing and Sanitation by the Housing Association, Mr. Ihlder prepared the following table:

Number of specials, January 1 to November 1:

	Complaints.	Recomplaints.	Total.
1916	58	49	107
1917	143	51	194
1918	320	102	422

Number of complaints to Department of Health, January 1 to November 1:

	Complaints.	Recomplaints.	Total.
1916	7,457	3,757	11,214
1917	7,874	2,812	10,686
1918	10,312	5,101	15,413

Including all types, January 1 to November 1:

	Complaints.	Corrections.	corrected. Per cent
1917	7,874	1,968	28.98
1918	10,312	2,240	21.71

MISCELLANEOUS

Proposes Foods Be Classed as Utilities.

New York, N. Y.—The new Governor, Alfred E. Smith, has been asked to bring about legislation as soon as possible to make such fundamental foods as bread, meat, eggs, milk and vegetables, including potatoes, public utilities, according to Laura A. Cauble, deputy commission of markets. Miss Cauble spoke for Jonathan C. Day, commissioner of markets. "Speaking for Mr. Day as well as for myself," she said, "I can say that we believe that making fundamental foods public utilities through an act of the legislature will give the people the right and the opportunity to find out what the costs of production are, will permit them to say whether present prices are justified, and will give them the power to regulate those prices downward if they are too high. Making foods public utilities would work toward better conditions for both the producer and consumer."

May Sell War Materials to Public Institutions.

Trenton, N. J.—Major Gen. George W. Goethals, Director of the Purchase, Storage, and Traffic Divisions of the War Department, has approved a suggestion made by Burdette G. Lewis, New Jersey State Commissioner of Charities and Corrections, that state and municipal institutions have an opportunity to buy at reasonable cost surplus materials which the army no longer wants and the states need badly for their wards. In reply to a letter in which Dr. Lewis made the suggestion, General Goethals wrote: "Your plan for the disposition of surplus stocks is a very practical one. A surplus property division has been created and a catalogue of such material now is in preparation." Mr. Lewis is asked to have the state purchasing agent take up the matter with L. H. Hartman, chief of the new division, at Washington. A further suggestion of Mr. Lewis that the state of New Jersey be allowed to purchase barracks no longer needed by the War Department, move them to state institutional property, and thus relieve over-crowding and care for dependents now on the waiting list also is receiving consideration.

LEGAL NEWS

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Liability of City Treasurer for Deposited Funds.

(Mo.) Where municipal funds are delivered to a city treasurer by the mayor and board of aldermen, the treasurer under Rev. St. 1909, § 9395, is bound to account for such funds at his peril, and, regardless of power under section 9371 to manage and control such funds, the mayor and board of aldermen cannot even by ordinance free such treasurer from his liability as such and clothe him with the character of an agent.—University City v. Schall, 205 S. W. 631.

Where a city treasurer deposits funds of a municipality in a bank, and the deposit is not special in character, the liability of the treasurer is absolute.—Id.

Doubtful Municipal Contract—Construction in Favor of Public.

(Wash.) Where the language of a municipal contract leaves the intention of the parties doubtful, it is ordinarily construed most favorably to the public.—Puget Sound International Ry. v. City of Everett, 175 P. 40.

Insubordination of Employe—Sickness—Dismissal.

(N. Y. Sup.) Where a city employe having served faithfully for 20 years, commits acts of insubordination while in a mentally deranged condition, or in a condition of extreme nervous prostration, he should not be dismissed, but at most should be retired for disability, or temporarily suspended.—People ex rel. Murray v. Connolly, 172 N. Y. S. 48.

Where city employe, after 20 years' faithful service, was tried for insubordination and dismissed without a medical inquiry, although he claimed sickness and nervous breakdown, the Supreme Court, on certiorari to review commissioner's determination, where record suggests that employe, at time of committing acts complained of, was suffering from extreme nervous prostration, will annul determination and order new hearing.—Id.

City Purchase of Right of Way—Opening Street.

(Fla.) A city can purchase a right of way over the lands of a railroad and pay for it in cash, or it may in consideration of benefits which it derives from the opening of a street over the railroad's land, take upon itself the expense of protecting persons and property using the street.—Florida East Coast Ry. Co. v. City of Miami, 79 So. 682.

Power to Create Transit Commission—Initiated Ordinance.

(Ohio) Initiated Ordinance No. 45222 of the city of Cleveland, entitled "An ordinance to provide for the appointment of a rapid transit commission," is valid, though it does not specify in terms the powers and duties of the commission; it being sufficient to refer to the statute defining the functions of such commissions.—State v. Otis, 120 N. E. 313.

An initiated ordinance repeals a prior ordinance in so far as the two ordinances are in conflict.—Id.

Cleveland City Charter, § 77, creating a city plan commission, with power to control "the plan, design, and location of public buildings, harbors, bridges, viaducts, street fixtures," etc., does not preclude the creation by ordinance of a rapid transit commission with the powers conferred by Gen. Code, § 4000—16 et sequ.—Id.

NEWS OF THE SOCIETIES

Jan. 13.—AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Annual meeting, New York City. Deputy secretary, B. Etchelle, 35 Nassau St., New York City.

Feb. 18-21, 1919.—AMERICAN ROAD BUILDERS' ASSOCIATION. Sixteenth annual convention and Ninth American Good Roads Congress under the auspices of the A. R. B. A., Hotel McAlpin, New York, N. Y. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

Nov. 12-14, 1919.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

National Highway Traffic Association.

At the public meeting of the National Highway Traffic Association, held at the Automobile Club of America on December 16, the subject of "Segregated Traffic Streets" was discussed from many angles.

Dr. John A. Harriss, deputy police commissioner in charge of traffic, New York City, stated that it was his impression that the order restricting certain thoroughfares for the use of commercial and passenger vehicles, respectively, which became effective last September, has been eminently effective and has proven satisfactory to the public.

Confronted with an almost unlimited number of vehicles of all types, and having but a limited amount of roadway space accessible for their use, it became an absolute necessity to so distribute the traffic on the streets as to minimize the possibility of a serioue general traffic congestion.

Provision had to be made, of course, for exceptions with compliance by vehicles ordinarily granted the right of way under the law, and for the use of any thoroughfare, irrespective of class designation, by vehicles receiving goods or making deliveries, or transacting any other business, but care has had to be exercised in the case of such vehicles in order to prevent an abuse of the privilege thus afforded them, and to this end they are required to enter and leave by the nearest intersecting thoroughfare. A further concession is granted such vehicles when transacting business at places but a few blocks distant from each other, but they are required to resort to the particular thoroughfare set aside for their use immediately upon the completion of their business.

William P. Eno, chairman, District of Columbia Highways Transport Committee, presented the following conclusions: The segregation of special kinds of traffic to certain streets, I believe, should be put into effect only after a more careful study of the subject than has evidently been given it. I do not think it is necessary or advisable to exclude light traffic (and by this I refer not only to light passenger vehicles but to light delivery wagons and to any other light, fast-moving vehicles which do not obstruct traffic) from any street but I do believe that all vehicles when moving slowly should be forced to keep near the right hand curb. On some important shopping streets, such as Fifth and Madison avenues, however, heavy, slow-moving vehicles should be excluded during congested hours and cruising cabs should be obliged to move briskly when in the stream of traffic in order not to obstruct following vehicles. My opinion is that segregated traffic is a mistake except during congested hours when it is highly desirable to deflect heavy, slow-moving vehicles from important shopping streets at the discretion of the police.

Arthur G. McKeever, president, Ajax Trucking Company, stated that it was a fundamental principle to associate on the street set aside for segregated traffic vehicles capable of maintaining the same average of speed in travel, and in starting and stopping.

Robert Lee Morrell, president of the Metropolitan Consulate of the American Automobile Association, stated that it was essential that the existing regulations in this city be modified. For example, Lafayette street and Fourth avenue should be available for both commercial vehicles and passenger cars.

It is essential that existing regulations segregating traffic be modified if not entirely suspended during periods of heavy snow fall, for the following reason: It is the custom in clearing the snow from the streets of this city to clear first the main north and south thoroughfares, the side streets come last and often the snow is left there to melt. In other words, during the period of deep snow the side streets are all but impassable. Present regulations require commercial vehicles to make such extensive use of side streets that a serious tie-up may be expected during a period of deep snow.

Richard W. Meade presented a number of resolutions, in connection with which Mr. Meade stated that the most useful contribution he could make to the subject is some specific illustration of how the regulations would work if they were enforced or enforceable. While these illustrations were selected to throw into strong relief the harmful effects of the regulations and the fact that instead of conducting to safety they must actually tend the other way through the increase of vehicular mileage and crossings of avenue traffic, yet they are entirely typical in character, and in the case of the delivery wagon in extent also, of what would be daily occurrences if the regulations were observed or enforced. To say that the traffic officers have discretion to waive the regulations in any case where they would result in hardship is not a satis-

(*Continued on page 21.*)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Walker County Commissioners, LaFayette, La., will construct a BRIDGE across Cane creek of two spans, reinforced concrete. The consulting engineers are the Cushman-Farleigh Engineering Co.

Tracy, Minn., is to make PAVING IMPROVEMENTS, involving the paving of twenty-five blocks in the business and residential section to cost about $75,000. Plans were prepared by the consulting engineer, J. W. Shaffer.

The state legislature will be asked to authorize the construction of a CENTRAL POWER PLANT at Grand Forks, N. D., to cost $150,000. The preliminary plans were made by the consulting engineers, Rose & Harris.

The Adair Salt River Drainage District, Kirksville, Mo., is to build a DRAINAGE SYSTEM consisting of five and a half miles of drainage canal, involving 185,000 cubic yards of excavation. The consulting engineer is James E. Bonnell.

Martinez, Cal., is to build a reinforced concrete and earth RESERVOIR, 1,500,000-gallon capacity, and other WATERWORKS IMPROVEMENTS, according to plans prepared by the consulting engineering firm of Olmsted & Gillelen.

Plans are being finished for the construction of a SEWAGE DISPOSAL PLANT at Milton, Pa. The consulting engineer is Alexander Potter.

Geneva, Neb., is asking for bids for WATERWORKS IMPROVEMENTS, according to plans prepared by the consulting engineering firm of Grant & Fulton.

WATERWORKS IMPROVEMENTS are to be made by the city of Pipestone, Minn., to cost $77,000, according to plans prepared by the consulting engineer, L. P. Wolff.

Ferndale, Mich., plans making WATERWORKS IMPROVEMENTS, involving the building of water mains to cost $99,000, and a SEWERAGE SYSTEM to cost $300,000. The consulting engineer is George Jerome.

Tentative plans have been prepared and submitted by the consulting engineer, J. E. Greiner, for the construction of a BRIDGE in Baltimore county, Baltimore, Md. The bridge is to be nine miles in length, extending over Chesapeake bay, and the plans include reinforced concrete double decked bridge and double railway tracks. Two widths were suggested, one 40 feet to cost $18,000,000 and one 30 feet to cost $12,000,000.

INDUSTRIAL NEWS

War Industries Board Ends Work.

The War Industries Board ceased its functions January 1, as was officially announced by Bernard M. Baruch, the Chairman. Certain activities of the board, according to the wish of the President, will be transferred to other departments of the Government and will continue in operation for the present. The War Trade Board will take over most of the activities of the War Industries Board, which the administration feels necessary should remain in existence for some time.

Chairman Baruch made a statement, which reads in part:

"It has been arranged that the powers and duties of the Division of Planning and Statistics of the War Industries Board shall, on Jan. 1, be taken over by the War Trade Board, along with such officials or employes of the Board as may be necessary.

"The Price Fixing Committee of the War Industries Board will continue to function until such of the prices already fixed by the committee, as will not expire on or before Jan. 1, shall have expired.

"In thus announcing the final windup of the War Industries Board, the chairman cannot refrain from once more expressing his great appreciation of the devoted efforts of those associated with him in the direction of the Board's activities, and of the whole-hearted and loyal co-operation of the industries of the country."

New Form of Steel Contract.

At a meeting of the board of directors of the American Iron and Steel Institute, held in Pittsburgh, a new form of steel sales contract was approved, so drawn up as to make the contract binding upon both buyer and seller. The object is to reform trade practice in the sale of finished steel products, as for many years a very considerable portion of the finished steel sold, while nominally under definite contract, really represented an option given. Sales of coke, iron ore, pig-iron, and unfinished steel have always been regarded as outright sales, and the buyer was expected to live up to the contract even if the market went against him.

In the case of many finished steel contracts the buyer would refrain from specifying if the market declined, and the mill would make a price adjustment. The practice is commonly regarded as one of the relics of the "controlled market" when it was difficult to induce buyers to contract ahead freely unless they were assured that they would be taken care of in case an accident happened to the market. If the days of the "controlled market" passed with the Gary dinner period, as steel producers represent is the case, the producers have lost the beneficial part of the system while they are still saddled with the inconvenient part.

Steel producers have not formally announced adoption, individually, of the new contract form, but are expected to do so before the end of the year. Many in the trade look to the Carnegie Steel Company to take the lead on adopting the new contract, as it is frequently held that this company, passively at least, has been largely responsible for the continuance of the practice.

The new contract form provides for compensating damages. If the buyer fails to specify on a declining market he must reimburse the seller. If the seller fails to deliver on a rising market, he must reimburse the buyer. In each case the measure of the reparation is to be the difference between the contract price and the open market price at the time of the failure to specify or to deliver, as the case may be. In order to simplify adjustments under the contract it is provided that in no case is the reparation to be less than 5 per cent. of the contract price. Ten per cent. was originally contemplated, but with the present high prices this was held to figure out too large an amount in dollars per ton and the smaller figure has been adopted.

CLEANING OUTFIT.

For Pumping Out Contents of Cess-Pools, Catch-Basins, Vaults, Etc.

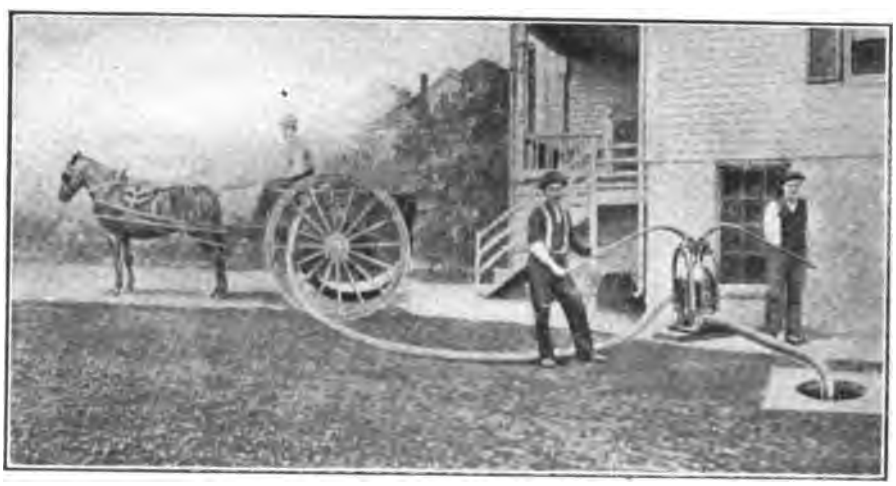
The frequent need by municipalities of all sizes for an economical, practical and adaptable outfit for cleaning out such potential hazards as cesspools, catch-basins, vaults, etc., has been met by a combination of standard Holzbog wagon and an Edson diaphragm pump. The outfit is easily and cheaply operated, is always available for service, and is durable.

A standard 54-cubic foot cart is used. The specially-shaped tank is made of steel, thoroughly riveted and watertight. The consequent advantages in cleanliness and absence of nuisance are obvious. The lids, of which there are two, one in front and one in rear, allow of completely filling the body. They are made with deep flanges, close fitting, and when down, are securely locked in place. The rear lid is operated by a spring handle on the side of the body and can be locked open at any of several positions when the vehicle is being loaded or dumped.

A very important and convenient feature of the cart is the low hang, which allows of very easy loading. The distance from ground to top of tank when level is about 51 inches. This may be reduced considerably by tipping the tank at a slight angle. The tank is well balanced, so that the vehicle even when full travels easily, and without undue strain on the horse. The tank being adjustable at any any angle, the load is completely discharged without raking out, and for convenience in washing, etc., the body can be locked in any position and the interior thoroughly cleansed. Dumping is by simple gear arrangement instead of by chain.

All the castings in the vehicle are made of steel, malleable iron and pig iron, mainly of the first two. The axle is built up of five pieces, which allows that portion of it going through the body to be encased in a steel boiler tube, expanded at the ends. This eliminates the possibility of leakage at these points. All metal parts are made and finished to exact standard patterns and repairs can therefore be made quickly and cheaply and new parts will almost always fit without further machining. Archibald iron hub wheels of best quality are used, but Warner, Sarven or plain wood hub may be had if desired. The weight of this standard two-wheel vehicle is 1,700 pounds.

The diaphragm pump is made for 3-inch suction and discharge hose, has side inlet and outlet and large handhole for cleaning. It weighs 270 pounds, occupying a space 15x15x42 inches high. It holds 3,500 gallons of water or is able to handle semi-fluid material through 25 feet of suction and through up to 200 feet of discharge hose with the labor of only two men.



PUMPING OUTFIT CONSISTING OF HOLZBOG WAGON AND DIAPHRAGM PUMP FOR CLEANING CESSPOOLS, CATCHBASINS, ETC.

It is supplied with operating handles and odorless cap if desired.

The cart described is one of a line of carts for sanitary uses and for transporting garbage, cement, etc. They are made with two or four wheels, for one or two horses. They range in capacity from 37 to 80 cubic feet. The "Columbian" type is of similarly strong construction but has a rear scoop body, without lids; it has no dumping gear, but a special leverage dumper; it has no axle drop or tube so that the body is higher than in the other type.

The carts described are made by Geo. H. Holzbog & Bro., Jeffersonville, Ind., which sells the whole pumping outfit.

Surplus Government Auto Vehicles Taken by Industry.

The surplus stocks of automobiles and trucks in the War Department will be taken up by the automobile industry. An agreement to this effect has been made between representatives of the auto manufacturers and officials of the War Department, the action having been taken to prevent a disorganization of the business by a possible flooding of the market with Government machines. The War Department announces, however, that there is no immediate probability of this, because the indications at present are that the Government machines will be needed for some time, and care will be taken to cause the trade as little disturbance as possible.

The American-La France Fire Engine Co., Elmira, N. Y., has shipped the following orders for fire apparatus: Superior, Wis., type 12 triple comb. chem. eng. and hose car, type 12 comb. eng. and hose car; La Salle, Ill., type 12 triple comb. chem. eng. and hose car.; Logansport, Ind., type 14 city service truck; Philadelphia, Pa., type 12 triple comb. chem. eng. and hose car; Wapakoneta, Ohio, type 12 triple comb. chem. eng. and hose car; Red Bank, N. J., type 75 triple comb. chem. eng. and hose car; Waterbury, Conn., type 12 pumping engine and hose car; Manitowoc, Wis.; type 12 triple comb, and hose car; Central City, Neb., Brockway combination; Central City, Neb., Brockway combination; Martinsburg, W. Va., type 12 triple comb. chem. eng. and hose car; Camp Mills, L. I., N. Y., triple comb. chem. eng and hose car; Cuyahoga Falls, Ohio, type 12 triple comb. chem. eng. and hose car; Cicero, Ill., comb. chem. eng. and hose car; Providence, R. I., type 17 tractor; Monte Vista, Colo., type 40 comb. with junior pump; Cambridge, Mass., type 31 75-ft. aerial truck; Portland, Me., type 40 triple comb. chem. eng. and hose car; Framingham, Mass., type 12 triple comb. chem. eng. and hose car; Waukegan, Ill., triple comb. chem. eng. and hose car; Portland, Me., triple comb. chem. eng. and hose car; Framingham, Mass., type 12 triple comb. chem. eng. and hose car; Waukegan, Ill., type 12 triple comb. chem. eng. and hose car; Portland, Me., type 12 triple comb. chem. eng. and hose car; St. Louis, Mo., type 14 comb. chem. eng. and hose car; Winston-Salem, N. C., type 14 comb. chem. eng. and hose car; Spencer, Iowa, type 12 triple comb. chem. eng. and hose car; Waltham, Mass., type 14 city service truck chassis. The company has received the following orders for equipment: Annapolis, Md., type 75 comb. with jr. pump; Chester, Pa., type 12 triple, type 31 75-ft. aerial truck; Hastings, Mich., 40 comb. chem. eng. and hose car; Atlas Powder Co., Perryville, Md., Brockway type D chemical engine.

The Western Paving Brick Manufacturers' Association, Dwight Bldg., Kansas City, Mo., announces that Major Clark R. Mandigo, engineer, has been honorably discharged from the army after nineteen months' service, including service with the A. E. F., and has returned to the association in his former position of consulting engineer.

"Watertight Concrete."

This is the subject of a recent publication of timely interest issued by the Hydrated Lime Bureau (now the Construction Bureau) of the Lime Association, 503 Riggs bldg., Washington, D. C. This bulletin, No. F-3-2, describes and illustrates very interestingly the whole subject of obtaining watertight concrete through the use of hydrated lime. The data is presented in a very logical and convincing manner, beginning with general considerations and a clear study of the technical and economic requirements of a good waterproofing material. Authoritative facts about hydrated lime are presented, including material from the U. S. Bureau of Standards. A large number of examples of the use of hydrated lime in structures of a watertight character are described and shown in excellent illustrations. These include the Stony Brook sewer, Boston, Mass.; the Stockton street tunnels and Twin Peaks, San Francisco, Cal.; the Superior street viaduct, Cleveland, O.; the St. Louis, Mo., filtration plant; new Austin, Tex., dam; reservoir at Waltham, Mass., and concrete water tank at Kokomo, Ind.

This bulletin, which is issued for general distribution, should be of real value to all interested in concrete structures.

INDUSTRIAL NEWS

(*Continued from page* 19)

factory answer, because, in the first place, such appeals and decisions are unpractical in most cases, and second because regulations that in their general application require variation every hour and minute of the working day are clearly unworkable.

He gave a specific case of a light delivery wagon having ten deliveries to make in a small district. Without restriction the wagon could make these deliveries by running about three miles, crossing one avenue seven times and not crossing the traffic of any other avenue. To comply with the regulations the vehicle would be compelled to run about seven miles—more than twice as far—and make a total of 62 crossings of avenue traffic.

Other speakers were S. W. Taylor, president, Rider and Driver; George Keegan, of the Interborough Railway; Charles G. Bond, counsel of the Motor Truck Association of America; Ernest P. Goodrich, former consulting engineer to the president of the Borough of Manhattan; and Joseph K. Orr, president, New York Team Owners Association.

At the conclusion of the discussion Mr. Meade's resolutions were referred, with power to act, to a special committee to be appointed by the president. These resolutions declared that the regulations must be radically revised.

American Society of Landscape Architects.

A special meeting of the American Society of Landscape Architects was held in Washington, Dec. 7.

"This meeting was called," said Professor J. S. Pray, of Harvard, president of the society, "to consider how we may best be of service here and overseas during the reconstruction period. The country is faced, for instance, by a large building program. Better and more economical results will be secured by the cooperation of the landscape architect. He is likely to be called in more and more upon these and city planning problems."

A medalion was presented to F. L. Olmsted by the society at the convention dinner in appreciation of his part in the winning of the war. It was pointed out that as his father, the great artist and landscape architect, Frederick Law Olmsted, had employed his powers of organization and his sturdy good sense most effectively, as head of the Sanitary Commission during the Civil War, so the son had made a similar contribution during the present war to the housing of both troops and munition workers. The medalion represents the Goddess Vesta, whose charge it is to "keep the home fires burning," hand in hand with Mercury, the Roman God of Industry.

"Of the 84 members of the American Society of Landscape Architects conducting their own offices, 43 have been called in one way or another into government service, either by the Housing Bureau, the Construction Division of the Army or the Shipping Board," said Mr. Olmsted, who is now serving as chief of the Town Planning Division of the U. S. Housing Bureau. "This is a remarkable record, especially since landscape architecture is considered by the man in the street as an occupation only for settled conditions, and even something of a luxury. The fact is that in this emergency, the landscape architect was found preeminently qualified to serve in one field of

town planning required by the government in laying out cantonments for troops, and industrial housing developments for war workers. Consequently he was drafted to this service. If our experience in the Housing Bureau has proved anything," continued Mr. Olmsted, it is the possibility and value of a thoroughgoing cooperation between the architectural, town planning and engineering professions. In our office, each has been represented by a division, all working together at adjacent desks and all assisting in the solution of every problem. It offers a fine promise of the future for building and land subdivision in all its branches."

The convention was held in Washington on account of the many landscape architects who are working in the U. S. Housing Bureau and the Construction Division of the Army. Its chief work was to consider how the society can be of further service and how the work in town planning and industrial housing which the U. S. Housing Bureau has so admirably started may not be lost.

Professional men from California, Missouri, Minnesota, Ohio, Michigan and many of the more Eastern states were present.

The president of the society is Professor J. S. Pray, Cambridge, Mass., and the secretary, A. F. Brinkerhoff, 527 Fifth avenue, New York City.

National Drainage Congress.

At the seventh annual meeting of the National Drainage Congress which was held in Chicago, Dec. 13 and 14, resolutions favoring the appropriation of a billion dollars by the Government for the reclamation of wet lands; the selling of the best reclaimed lands available to returned soldiers and sailors by the Government at actual cost; the creation of a federal department of public works, with a place in the cabinet for its head, and the betterment of waterways, roads, and other internal improvements, were adopted.

President Wilson was asked to appoint the Waterways Commission of seven members as authorized by the law on the subject passed in August, 1917, and besides the army engineer required by law to head the commission, to appoint not less than three civil engineers.

The following projects were recommended: The Atlantic coast waterway; the Lake Erie and Ohio River Canal; the Ohio River improvement; storage reservoirs on the Alleghany, Monongahela and other rivers, as means of flood control and aids to navigation; the Lake and Gulf waterway from Chicago; and the improvement of the Upper Mississippi, the Missouri and the Columbia Rivers.

Federal aid for drainage of swamp and overflow lands, similar to that already extended by the Government for irrigation, was urged. As local projects of this class have been devised usually with little regard to general plans covering the valleys in which they are located, the Governors of the states are asked to consider the desirability of unifying state agencies responsible for water resources, and the desirability of advocating the passage of state acts to revise the drainage laws. Related to this was a resolution authorizing the president of the drainage congress to appoint a committee to report some plant for stabilizing the value of drainage bonds and other securities for improvement works.

Diversion of flood waters and their subterranean storage for the benefit of the semi-arid lands was also urged with the recommendation that Congress provide necessary funds.

Plans were favored for providing good agricultural lands for soldiers and sailors returning to civil life, such lands to be sold at cost and upon favorable terms.

Highway development was indorsed and alliance with the National Highway Association was proposed. A telegram was sent Secretary McAdoo protesting against the revocation of contracts for barge construction or interior waterways.

The following officers were elected: President, Edmund T. Perkins, Chicago; vice-presidents, F. H. Newell, Urbana, Ill.; A. J. Kelly, Jr., Pittsburgh; John A. Kruse, New Orleans; J. L. Craig, Stockton, Cal.; H. M. Sparboe, Webster City, Ia.; treasurer, Charles G. Dawes, Chicago.

New England Waterworks Association.

The annual meeting of the New England Waterworks Association will be held at the Hotel Brunswick, Copley Square, Boston, Mass., on Wednesday, January 8.

In the morning the executive committee will meet at headquarters, in the Tremont Temple.

At 1 p. m. lunch will be served at the Hotel Brunswick. The meeting will follow the luncheon, beginning with reports by the secretary, treasurer, editor and auditors.

The following committees will then report:

"Standard Specifications for Cast Iron Pipe." F. A. McInnes, Chairman.
"Standard Specifications for Fire Hydrants." H. O. Lacount, Chairman.
"Statistics of Water Purification Plants." Geo. C. Whipple, Chairman.
"Leakage of Pipe Joints." F. A. Barbour, Chairman.
"Proposed Standard Schedule for Grading Cities and Towns of United States with reference to their Fire Defences and Physical Condition." Frank A. McInnes, Chairman.
"A National Water Law." Caleb M. Saville, Chairman.
"Uniform Accounting." Albert L. Sawyer, Chairman.
"Standard Specifications, for Meters." Charles W. Sherman, Chairman.
"Revenue from Fire Services." W. C. Hawley, Chairman.
"Public Hearing of the American Society of Mechanical Engineers for the Discussion of the Power Test Codes of that Society." Caleb M. Saville, Chairman.
"Frozen Service Pipes." Frank J. Gifford, Chairman.
"Priorities." Willard Kent, Chairman.

The annual address of the president, Carleton E. Davis, Philadelphia, Pa., will then be delivered. Following this, new officers will be elected.

New Jersey State Association of County Engineers.

A meeting of the New Jersey State Association of County Engineers is to be held January 10 and 11 at "The Washington," Newark, N. J. James Logan, Monty Holley, is president, and T. J. Wasser, Jersey City, is secretary.

Michigan Engineering Society.

The annual convention of the Michigan Engineering Society will be held at Flint, Mich., January 21 to 23, 1919. The subjects covered will include roads and bridges, drainage, sanitary engineering, legislation, municipal engineering, hydro-electric engineering and surveying. The president of the Society is E. D. Rich and the secretary Wm. W. Cox, 508 West Madison street, Lansing, Mich.

Trunk Highway Association.

At the recent meeting in Chicago of the Joint Highway Congress held under the auspices of the American Association of State Highway Officials and the Highway Industries Association, were present representatives of twelve organized trunk line highways. Preliminary arrangements were made to form these into an association and to hold a meeting at Kansas City as soon as possible after Jan. 15. The newly formed organization tendered its support to the associations holding the congress, for a broad-gage policy for the construction of a system of national highways not to exceed 50,000 miles, to connect the important centers of population and industry, without regard to state lines.

H. O. Cooley, of Minneapolis, representing the Yellowstone Trail, and Wesley L. Connett were elected president and secretary, respectively.

PERSONALS

Whitmore, Charles A., Visalia, Cal., has been appointed to the California state highway commission, succeeding Henry J. Widenmann, who died recently.

Stern, Charles F., one of the three members of the California Highway Commission, has been appointed state superintendent of banks.

Campbell, Archibald W., who has been deputy minister of railways and canals for the Dominion of Canada, has been appointed a commissioner to investigate and report to the Canadian Government on the question of good roads construction. Mr. Campbell was for many years deputy minister of public works for Ontario.

ADVANCE CONTRACT NEWS

ADVANCE INFORMATION BIDS ASKED FOR

CONTRACTS AWARDED ITEMIZED PRICES

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
			STREETS AND ROADS.	
Pa.,	Johnstown	noon, Jan. 4.	Approximately 36,700 cu. yds. excavation and 19,960 cu. yds. of fill on road in Upper Yoder Twp.	L. R. Owen, Twp. Engr., Otto Bldg.
Pa.,	Johnstown	Jan. 4.	Paving with vitrified brick on concrete base.	W. Mosholder, Pres., Bd. of Supervs., Upper Yoder Twp.
Ariz.,	Holbrook	Jan. 6.	Building 8 mi. of road, involving earth excavation, gravel surfacing, rubble paving, rubble masonry and culvert pipe	W. E. Ferguson, Sec., Co. Hwy. Comn.
Wash.,	Seattle	Jan. 6.	Grading and graveling road, including building trestle and wharf	N. W. Wardall, Clk., Bd. of Co. Comrs.
Miss.,	Greenwood	Jan. 6.	Furnishing gravel for resurfacing public highways; furnishing one auto truck and one or more trailers for use on public highways.	Eli Abbot, Engr.
Ind.,	Decatur	10 a.m., Jan. 6.	Constructing two macadam roads in Washington and Wabash Townships	John Mosure, Co. Aud.
Okla.,	Tulsa	2 p.m., Jan. 6.	Construction of 33 mi. of roads to be graded and brought to the established grade	County Engr.
Ind.,	Rensselaer	2 p.m., Jan. 6.	Construction of a gravel road in Union Twp.	Jos. P. Hammond, County Aud.
Ind.,	Paoli	2 p.m., Jan. 6.	Construction of road in Paoli Twp.	P. M. Stephenson, Co. Aud.
Ariz.,	Holbrook	2 p.m., Jan. 6.	Improving 4.5 mi. of road.	Highway Engineer.
S. D.,	Vermillion	2 p.m., Jan. 7.	Grading and earth fill to bridge.	Wm. J. Russel, Co. Aud.
O.,	Coshocton	Jan. 7.	Construction of gravel road in Newcastle Twp.	County Surveyor.
Ind.,	Delphi	1.30 p.m., Jan. 7.	Construction of a gravel road in Democrat Twp.	H. D. Good, Co. Aud.
Ind.,	Wabash	10 a.m., Jan. 7.	Construction of a gravel road in Waltz twp. and a gravel or stone road in Liberty twp.	Frank P. Kircher, Co. Aud.
Ind.,	Corydon	2 p.m., Jan. 7.	Construction of stone road in Washington Twp.	Sam C. Mauck, County Aud.
Ind.,	Martinsville	2 p.m., Jan. 7.	Construction of a brick road in Washington Twp.	Sam Watson, County Aud.
Cal.,	Stockton	10 a.m., Jan. 7.	Improvement work on county road.	Eugene D. Graham, Clk., Bd. of Superv.
Cal.,	Riverside	Jan. 8.	Building road, involving 1,033 cu. yds. class A concrete paving, etc.; alternate bids will be received for 66,940 sq. ft. 5-in. oil-macadam paving.	A. B. Pelch, Clerk
S. D.,	Deadwood	10 a.m., Jan. 9.	Construction of 1.75 mi. road, involving 4,000 cu. yds. solid rock excavation, 7,000 cu. yds. loose rock excavation and 4,000 cu. yds. earth excavation.	Fred Harris, Co. Aud.
Tex.,	Jasper	10 a.m., Jan. 14.	Construction of a hard-surfaced road with concrete drainage structures, 12.4 mi. in length.	G. H. Abney, Co. Engr., Court House
Wash.,	Seattle	10 a.m., Jan. 13.	Construction of road trestle.	Norman M. Wardall, Clk., Bd. of Co. Comrs.
Ind.,	Indianapolis	10 a.m., Jan. 15.	Construction of a gravel road on township line between Washington, Wayne and Pike Twps.	Leo K. Fesler, Co. Aud.
Ark.,	Blytheville	Jan. 15.	Paving 2 mi. road, 20-50 ft. wide, involving 38,500 sq. yd. 6-10-in. concrete; also curbing, guttering and storm sewering same, involving 42,600 lin. ft. concrete curbing, 25,580 sq. yd. concrete guttering and 1,600 lin. ft. 15-18-in. vitrified pipe sewering.	Pride & Fairley, Engrs.
Kan.,	Oswego	2 p.m., Jan. 20.	Construction of sections A and B, Federal Aid Project No. 2, involving 54,332 cu. yds. earth excavation; 36,985 cu. yds. of borrow in earth; 31,605 cu. yds. gravel; 175.6 cu. yds. of 1-2-4 concrete; 752.1 cu. yds. of 1-3-5 concrete; 15,134 lbs. reinforcing steel, and 15 to 30-in. reinforced concrete culvert pipe.	W. J. King, County Engr.
Ill.,	Mt. Carmel	Mar. 1.	Paving city street.	G. C. Harvey, Engr.
			SEWERAGE.	
O.,	Eaton	noon, Jan. 4.	Construction of bridge Dixon Twp.	O., Heckathorne, Court House.
O.,	Warren	Jan. 6.	Improving a sanitary trunk sewer, involving 3,000 ft. 24-in. standard vitrified sewer pipe, 1,350 ft. 2-in., 3,350 ft. 20-in., 1,030 ft. 18-in., 3,750 ft. 15-in., and 1,250 ft. 12-in.	County Engineer.
S. D.,	Vermillion	2 p.m., Jan. 7.	Construction of bridges.	W. C. Russel, Co. Aud.
Neb.,	Geneva	8 p.m., Jan. 8.	Construction of a dug well 10 ft. inside diameter, and depth approximately 82 ft., with wells extending from this depth into a water-bearing stratum approximately 34 ft. deeper; a centrifugal pump, electric motor to be directly connected to pump, and piping from pump to the existing discharge line with a branch to water mains	Chas. Underwood, City Clk.
O.,	Canton	10 a.m., Jan. 8.	Construction of a storm water sewer, involving 553 cu. yds. of excavation; laying 15 and 20-in. sewer pipe; relaying 12-in. sewer pipe; 6 catch basins; laying 12-in. sewer pipe under roadway and relaying pavement.	W. C. Schick, Clerk
Ariz.,	Globe	noon, Jan. 9.	Construction of sanitary sewers, involving 18 miles of sewer lines from 6 to 18 ins., 280 manholes, 22 flush-tanks and 76 lampholes, and a sewage disposal plant consisting of two reverse flow Imhoff tanks, two sludge beds and chlorinator house with necessary excavation.	Benham Engrg. Co., Colcord Bldg., Oklahoma City, Okla.
Ark.,	Blytheville	2 p.m., Jan. 15.	Furnishing 1,600 lin. ft. 15 to 18-in. vitrified pipe storm sewer	Pride & Fairley, Engrs.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
			WATER SUPPLY.	
Pa.,	Oil City	Jan. 5.	Furnishing cast iron water pipe, from 4 to 24-in. inclusive; flanged cast iron pipe; special valves, fire hydrants, water meters, stop cocks, etc.	A. M. Breckenridge, City Clk.
Minn.,	Hallock	2 p.m., Jan. 7.	Construction of steel water tank	Earl D. Jackson, Cons. Engr., St. Paul, Minn.
Mo.,	Kansas City	2 p.m., Jan. 8.	Designing and constructing two steam turbine-driven centrifugal boiler feed pumps	W. G. Goodwin, Chief Engr. & Supt. of Water Dept.
Tex.,	Houston	Jan. 10.	Improving waterworks system, involving seven deep wells, deep well pumps, motor and electric generators.	E. E. Sands, City Engr.
Okla.,	Poteau	8 p.m., Jan. 31.	Installation of a water works system and filter plant, consisting of approximately the following: one brick pumping station, one brick filter house, one sedimentation basin, one pure water reservoir, two 100-hp. boilers, two high-service pumping engines, three steam-engine or turbine-driven centrifugal pumping units, two duplex boiler feed pumps, one condenser and air pump, steam and water piping, filter equipment for 2 tanks, one concrete overfall dam, and 3.5 miles cast-iron pipe, valves, hydrants	A. W. Lindsey, City Clk.
			LIGHTING AND POWER.	
O.,	Columbus	noon, Jan. 7.	Furnishing and installing covering for the new steam piping at the municipal light plant	Geo. A. Borden, Dir. of Public Service.
Minn.,	Hallock	2 p.m., Jan. 7.	Construction of 60,000-gal. steel water tank	Earle D. Jackson, Cons. Engr., St. Paul, Minn.
Tex.,	Houston	noon, Jan. 10.	Furnishing one generator complete with steam turbine condensers and switchboard, to be used at central water plant	E. E. Sands, City Engr.
N. Y.,	Utica	3 p.m., Jan. 14.	in the U. S. post office, custom house and court house buildings	Superv. Architect, Treasury Dept., Washington, D. C.
N. Y.,	Troy	3 p.m., Jan. 14.	Addition to conduit and wiring and lighting fixtures in the U. S. post office, court house, etc.	Superv. Architect, Treasury Dept., Washington, D. C.
			FIRE EQUIPMENT.	
O.,	Urbana	Jan. 7.	Furnishing motor fire equipment	City Council.
			BRIDGES.	
O.,	Easton	Jan. 4.	Construction of steel truss bridge in Dixon Twp.	Albert Campbell, Co. Aud.
Va.,	Bristol	noon, Jan. 4.	Construction of a wooden bridge and fill approaches to same in Washington County	A. H. Pettigrew, Div. Engr.
Minn.,	Duluth	9.30 a.m., Jan. 4.	Construction of a number of corrugated culverts, 12, 14 and 16 gauge	O. Halden, Co. Aud.
Miss.,	Columbus	2 p.m., Jan. 6.	Construction of two bridges	B. A. Lincoln, Co. Clk.
Okla.,	Tulsa	2 p.m., Jan. 6.	Construction of culverts and bridges	County Engr.
Ind.,	Vevay	1 p.m., Jan. 6.	Construction of reinforced concrete or iron bridge over Willow Creek	J. D. Froman, Co. Aud.
Miss.,	Vicksburg	noon, Jan. 6.	Repairing bridge	J. D. Laughlin, Chancery Clk.
Miss.,	Macon	Jan. 6.	Constructing six brick arches on two county roads	John A. Tyson, Chancery Clk.
Miss.,	Cleveland	Jan. 6.	Constructing two steel bridges across Sunflower River and one steel bridge across Bogue Phalia	P. B. Woollard, Clk., Bd. of Co. Superv.
D. C.,	Washington	2 p.m., Jan. 7.	Construction of bridges on Concord Avenue	E. D. E. Gargas, Chief Clerk, Room 427, Dist. Bldg.
Wash.,	Waterville	10 a.m., Jan. 7.	Construction of a six-bent frame trestle bridge	County Engr.
S. D.,	Deadwood	10 a.m., Jan. 10.	Construction of culverts, retaining walls, etc.	Fred Harris, Co. Aud.
Ark.,	Little Rock	noon, Jan. 10.	Construction of reinforced concrete arch bridge over Arkansas River	Lee Miles, County Judge.
Wash.,	Bellevue	10 a.m., Jan. 13.	Construction of a 600-ft. timbered trestle on cedar piles, 18 ft. wide	Sam Humes, Co. Engr.
Neb.,	York	noon, Jan. 14.	Constructing and repairing bridges in York County	Annie H Beck, Clk.
Neb.,	Broken Bow	Jan. 16.	Constructing and repairing steel and wooden bridges during 1919	R. E. Waters, Co. Clk.
Ind.,	Indianapolis	2 p.m., Jan. 16.	Reconstruction of the south wing of Riverside dam in White River in Riverside Park	Board of Park Comrs.
			MISCELLANEOUS.	
O.,	Columbus	noon, Jan. 6.	Furnishing 30,000 gal. gasoline for the municipal garage.	L. J. Guthke, Secy., Board of Purchase.
Tex.,	Galveston	Jan. 6.	Construction of hangars, pavement and beach (Spec. No. 3439)	Bureau of Yards and Docks, Navy Dept., Washington, D. C.
D. C.,	Washington	Jan. 6.	Furnishing steel, bronze, copper, pig tin, bolts, nuts, rivets, washers, pipe fittings, wrenches, vises, stocks and dies, pliers, garbage cans, firebrick pipe covering, rubber tires and tubes, paints and oils, putty, graphite, asphaltum, suphuric acid, lime, creosote oil, benzine, gas-engine oil, etc.	Gen. Purch. Officer, Panama Canal, Washington, D. C.
N. Y.,	Albany	noon, Jan. 7.	Improving New York state canals, involving excavating the canal channel in the Genesee River, completing canal from east guard-lock to Genesee River	W. W. Wotherspoon, Supt. of Pub. Wks., Capitol, Albany, N. Y.
Minn.,	St. Paul	11 a.m., Jan. 8.	Digging and constructing ditch No. 17 in Ramsey county.	Geo. J. Ries, Co. Aud.
Mich.,	Detroit	2 p.m., Jan. 8.	Furnishing structural steel and cast iron stair work for breakwater tower at Keweenaw Waterway, Mich.	Lighthouse Supt., 341 P. O. Bldg.
Ark.,	Bridge Junction	noon, Jan. 9.	Constructing approximately 600,000 cu. yds. of canal dredge work to drain lakes in Crittenden and Lee Counties	H. N. Pharr, Chief Engr.
Ind.,	Greenfield	Jan. 11.	Building drain in Brown twp., involving 24,680 ft. 4-24-in. tile, etc.	C. Boone, Co. Engr.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Ont.,	Stratford	Jan. 13	Construction of tile drain	P. Smith, R. R. No. 11, St. Paul's Station, Ont.
Tex.,	Bay City	Jan. 14	Dredging and delivering on wharf at Matagorda 24,400 cu. yds. mudshell and hauling and placing same on Matagorda-Big Hill Rd.	A. Lee, Auditor
N. Y.,	Albany	noon, Jan. 14	Improving the Cayuga and Seneca Canal, extending the core wall and other work at the north end of dam No. 2; drilling holes in the sill of the dam and the toe of the river wall of the lock near Rotterdam, and making necessary repairs in Erie Canal; furnishing and installing two 3-ton electric semiportal revolving jib cranes on pier 6, East River, N. Y. City	W. W. Wotherspoon, Supt. of Pub. Wks., Capitol, Albany, N. Y.
N. Y.,	Seneca Falls	noon, Jan. 14	Construction of barge canal section	W. W. Wotherspoon, State Supt. of Pub. Wks., Capitol, Albany.
Minn.,	Duluth	Jan. 15	Collection and disposal of garbage	B. Silberstein, Comr. of Safety.
Minn.,	New Ulm	Jan. 15	Building Judicial Ditch No. 6 in Brown county	C. N. Robertson, Engr.
La.,	New Orleans	11 a.m., Jan. 16	1,587,000 cu. yds. earth work in the Lower Tenasa, Atchafalaya and Pontchartrain Levee district	U. S. Engr. Office, 519 Canal St., New Orleans, La.
Ga.,	Carnesville	Jan. 15	Drainage work	W. R. Little, Secy., Middle River Dist., Franklin Co.
Ky.,	Madisonville	Feb. 3	Construction of Otter Creek ditch, involving 161,207 cu. yd. excavation, 126.48 acres clearing and 2 bridges, 30 ft. each	Basil M. Brooks, Secy., Drainage Board

ROADS AND STREETS

Holbrook, Ariz.—Navajo county highway commission lets contract soon for improvement of 4½ miles of the Snowflake road.

Santa Barbara, Cal.—Plans are being prepared for rebuilding East Blvd. back of its present location and far enough inland to make it safe from the ravages of the sea. In a report on the project the estimated cost of rights of way is $52,025; grading, $7,500; paving and sidewalk, $31,000, and riprap at $7,500, a total of $98,275. A sea wall will also be constructed at an approximate cost of $165,000. A. B. Cook, City Engr.

Pensacola, Fla.—Sealed bids will be received by the board of commissioners Jan. 20 for the purchase of all or part of $120,000 worth of improvement bonds to be used as follows: $50,000 for grading, paving and curbing or otherwise improving streets, including repaving and repairing of DeVilner and Garden Sts.; $10,000 for the purpose of extending and improving the city's water system; $20,000 for the purpose of extending and improving the city's sewerage and drainage system; $40,000 for the purpose of securing the surrender, relinquishment and reconveyance to the city of the water front property granted to John A. Merritt and J. S. Rese.

Savannah, Ga.—Chatham county commissioners will pass order recommending the issuance of $1,000,000 bonds, to be used for paving the Ogeechee road, the Louisville road, the Port Wentworth road, from the Terry Shipbuilding Corporation plant to the county line and Lathrop Ave.

South West La Grande, Ga.—See "Water Supply."

Indianapolis, Ind.—Resolution adopted, opening and extension of alley west of Spruce St., from Minnesota to alley south of Cottage.

Indianapolis, Ind.—A new state highway bill is being drafted for introduction at the coming session of the legislature. Under it a system of paved highways connecting the county seats, the main cities and the principal highways leading into adjoining states are to be constructed. The system of state roads would be between 3,000 and 4,000 miles long.

Muncie, Ind.—A $4,800 issue of Delaware county bonds was sold to A. J. McColly, Hartford City, Ind., for par, accrued interest and a $5.00 premium.

Princeton, Ind.—The J. F. Wild & Co. State Bank, Indianapolis, was the successful bidder for an $18,000 issue of Gibson county road bonds at a bid of $18,003.50.

Bozeman, Mont.—If plans of the Gallatin county board of commissioners and the Gallatin County Good Roads Association are carried out, several hundred thousand dollars will be spent in road building next year. A permanent road system is contemplated, made possible by a bond issue of $400,000, and, in addition, the county hopes to secure a $75,000 appropriation of federal aid money.

Canton, N. Y.—Extensive county road work for the towns of St. Lawrence was mapped out by the highway committee of the board of supervisors. The committee recommends the following apportionment of automobile moneys for the year 1919: To Pitcairn, for the improvement of the road leading from the Lewis county road near Harrisville toward Fullerville, known as the LaPlatney Rd., $2,500; to Fowler, for the improvement of the LaPlatney Rd., $2,000; to Russell, for the improvement of the road leading from Hermon Village to the Edwards line, $2,000; to Hermon, for the improvement of the road leading from Hermon Village to Edwards town line, $2,000; to Rossie, for the improvement of the road leading from Rossie Village toward Hammond Village, $1,500; to Pierrepont, for the improvement of the road leading from the village of Pierrepont toward the village of Colton, $1,500; to Norfolk, for the improvement of the road leading from the bridge across the Racquette, in Raymondville, toward the Louisville town line by way of Whittaker's Corners, $1,500; to Clifton, for the improvement of the road leading from Benson Mines toward Cranberry Lake, $1,000; to Parishville, for the improvement of the road leading from South Colton toward Stark, $1,000; to Colton, for the improvement of the road leading from Stark to Sevey's, and also the road known as the Shurtleff Rd., $1,500; to DePeyster, for the improvement of the road leading from Parish Corner toward Kokomo, $2,000; to Macomb, for the improvement of the road leading from Pope's Mills toward the De Peyster line, $2,000; to Stockholm, for the improvement of the road leading from Southville toward Stockholm Centre, $2,000; to Madrid, for the improvement of the road leading from Chamberlain's Corners toward Allen's Corners, $2,500; to Morristown, for the improvement of the road leading from the Black Lake Toll Bridge toward Morristown Village, known as the Four Rod Rd., $2,000. Totals, $27,000.

Syracuse, N. Y.—Common council authorized the paving of Exchange St. from Park to North Salina St. Bids will be asked to pave Graves St. from the south side of Beecher St. to Highland Ave.

Utica, N. Y.—Plans completed for Frenchville-Holland Patent road, Roma-Ava road, small strip of road in Rome, and Schuyler St. in Marcy. Address Arthur O'Brien, co. supt. of highways of Oneida county.

Charlotte, N. C.—A movement is under way in South Carolina to secure the passage of a law authorizing a statewide referendum on a proposed bond issue of $20,000,000 or $25,000,000 for the construction of a system of state highways connecting every county seat, under the direction of a proposed state highway commission to be composed of one member from each of the seven congressional districts, with power to employ its engineers and agents and to fix their compensation, according to announcement here by C. C. Kirkpatrick, who is the associate of Carl J. Baer in the Community Development Co. Mr. Kirkpatrick and Mr. Baer have been engaged to make a survey of the situation as proposed and to assist in advancing the movement.

Athens, O.—The paving of East State St. to the Children's Home has been authorized by the council. An estimate will be prepared at once. The paving of Byard St. will also be authorized.

Berlin Heights, O.—Council has decided to pave the main street at a cost estimated at $35,000. The county commissioners have agreed to pay half of the cost for paving 16 ft. wide.

Canton, O.—City Engineer Sarver announces that $130,000 in paving and street improvements, authorized by the council before the war, will go forward. These include paving Fourth, Navarre road, Spring Ave., 12th St., Edwards and 14th Sts.

Canton, O.—Approximately $130,000 in paving and street improvements, already authorized by council, but halted on account of the war, will go forward now, since government restrictions have been withdrawn. City Engineer Sarver has designated the following as the streets to be improved and the estimated cost of the contract: Fourth St. N. W.-McKinley Ave. to McGregor N. W., $47,800; Navarre road S. W.-Harrison Ave. to W. & L. E. tracks, $26,900; Spring Ave. N. E.-Ninth St. to 12th St. N. E., $20,700; 12th St. N. W.-Clarendon Ave. to Werts Ave. N. W., $10,800; total, $106,200. Edward Ave. N. E.-13th St. to 17th St. N. E., $10,900; 14th St.-Spring Ave. to St. Elmo Ave. N. E., $14,100.

Canton, O.—The state highway commission will aid the county in its plans for the Lincoln highway east of Canton and the Massillon-Canal Fulton roads. Aid to the extent of $10,000 per mile is understood to have been secured.

Cincinnati, O.—An ordinance providing for a bond issue of $400,000 for street repairs was adopted by council.

Chagrin Falls, O.—Village Clerk F. E. Lamson will take bids Jan. 6 for street improvement bonds, $2,112.54.

Chardon, O.—The town of Montville voted a $30,000 bond issue July 15, 1915, to build an improved concrete or brick road west of the Center to the Hambden line. This improvement will be made early in the spring.

Coshocton, O.—Contract let soon by county for the construction of 1,900 ft. of gravel road at Pomerene Station, New Castle township. R. E. Hamilton, county engr.

East Cleveland, O.—C. M. Osborn, city manager, states that the paving program in East Cleveland for the coming year calls for the paving of 8 streets, laying 5 sewers and 3,000 ft. of water pipe. Terrace road is to be extended from Windermere terrace to Nela Ave.

Kent, O.—Plans and estimates for the Cleveland-Kent road between Streetsboro and Aurora Centers are being prepared by the county engineer. State and federal aid for main market road No. 2 has been requested.

Lakewood, O.—The project to resurface Grace Ave., from Detroit to West Madison Ave., has been authorized in a resolution to instruct preparation of plans for this resurfacing by the engineer.

Lima, O.—A. L. Matheny, director of public service, will be ready for bids about April 1 for 30,000 sq. yds. of sheet asphalt for resurfacing. V. C. Miller, engineer, City Hall, is finishing plans.

Toledo, O.—Work of building a concrete road on Dorr St., from the city limits to Reynolds' corner, probably will begin next spring. The estimated cost will be $87,000.

Toledo, O.—Legislation for a bond issue of $520,000 for extending Summit St. to Broadway has been enacted. This improvement is to be made the coming summer.

Vermilion, O.—See "Sewerage."

Youngstown, O.—Plans for the paving of South Ave., Japan Ave., Thurman and Worthington Sts., are being prepared.

Albany, Ore.—Linn county is in favor of the proposed Memorial highway from Portland to Eugene. At a meeting of the Linn County Good Roads Association here the executive committee was instructed to draw up a resolution favoring the project, and members of the incoming county court promised that Linn county would do its share in the construction of the road.

Pendleton, Ore.—The roadbuilding project that will receive the first attention of the Umatilla county court this year is that stretch of the highway from Pendleton to the Morrow county line. Fifty thousand dollars or more will be appropriated for this work in co-operation with the state highway commission.

Coatesville, Pa.—Street improvement bonds, $130,000, authorized by borough council.

Eastland, Tex.—R. L. Rust, judge of Eastland county, will receive sealed bids, Dec. 30, for $180,000 road bonds.

Fort Worth, Tex.—Tarrant county commissioners are considering the issuance of road bonds for $400,000.

Orange, Tex.—Streets in business section of city will be paved shortly.

Snyder, Tex.—W. S. Adamson, judge of Scurry county, will receive sealed bids, Dec. 30, for $200,000 5 per cent. semi-annual road bonds.

Texarkana, Tex.—Brick paving on concrete base planned on number of streets. Address city clk.

Ogden, Utah—Ogden-Hooper road may be constructed of concrete instead of macadam. Address co. clk. of Weber Co.

Salt Lake City, Utah—Wendover highway will be widened at once. Ira R. Browning, state road engr.

Charlottesville, Va.—City considering paving various streets. E. G. Haden, mayor.

Aberdeen, Wash.—Development of a city park, improvement of a road to Montesano by construction of a new trestle, etc., have been endorsed by the chamber of commerce.

Ritzville, Wash.—Adams county has sold to the Lumbermen's Trust Co. of Portland an issue road bonds, $50,000.

Seattle, Wash.—Ordinance passed providing for the laying off and extending of Elliott Ave. N. through block 134, Seattle tide lands, and W. Garfield St., from Elliott Ave. N. to Smiths Cove waterway.

Seattle, Wash.—An unofficial understanding has existed for some time past that King and Pierce counties would co-operate in the construction of what will be known as the Highline road, which will shorten the distance for auto traffic between Seattle and Tacoma by 10 miles and eliminate the flood menace to this traffic on the so-called Valley road. Pierce county is working on plans for its portion of this road to the Pierce county line at present and it is believed by King County Engineer Sam Humes that King county will connect with the Pierce county road in the not far distant future.

Keyser, W. Va.—Mineral county will take new bids in spring for building Class A road between Ridgely and Alaska. J. V. Bell, clerk.

Hamilton, Ont.—The city council plans to pave roads at a cost of $227,000. Engineer, E. R. Gray.

London, Ont.—The city council will construct roads at a cost of about $400,000. S. Baker, clerk.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

St. James, Minn.—*J. McLaughlin & Sons, care of Minnesota Pipe & Tile Co., Mankato, for paving 20 blocks of street, about $100,000.

Cincinnati, O.—*Kirchner Construction Co., at $303,494.40, for the improvement of Madison road from Erie Ave. to the Baltimore & Ohio track. Board of control.

Chickasha, Okla.—*W. R. Palmer, Frederick, for building 11 mi. road, Grady county, about $14,000.

Memphis, Tenn.—*Roach, Stansell, Lowrance Bros. & Co., Memphis, Tenn., for constructing 731,000 cu. yd. of earthwork in upper and lower St. Francis levee district, at $461,700.

Dallas, Tex.—*Texas Bitulithic Co., for resurfacing Grand Ave. from Oakland to Meyers St., at $6,750.

Brantford, Ont.—*Johnson Bros., 43 Market St., for construction of walks and sewers costing $80,000 for the Lansdowne Park Co.

SEWERAGE AND SANITATION

Pensacola, Fla.—See "Streets and Roads."

South West La Grande, Ga.—See "Water Supply."

Dubuque, Ia.—City rejected bids for sewer, Queen St., $1,250; new bids about Feb. 1.

Casey, Ill.—Board of local improvements receiving bids sanitary sewer, $10,000. R. A. Young, pres. Engr., T. A. Hardman, Olney, Ill.

Greenfield, Ind.—For the construction of the Wm. L. Cook et al drain in Brown township, Chas. Boonse, surv. and engr. of Hancock county, taking bids.

Pontiac, Mich.—An estimate of $225,000 has been given the city on cost of installing Imhoff tanks to replace the present sewer system, which empties into the Clinton river. Bonds will be submitted to the people next spring or summer.

Faribault, Minn.—City contemplates storm sewer, 33 to 36-in. vitrified tile. Frank McKellup, engineer.

St. Louis, Mo.—To improve sewers and drainage system in parks, city plans to issue $25,000 bonds. E. R. Kinsey, pres. board pub. service.

Rochester, N. Y.—S. N. Bond & Co., of New York, successful bidder for the 8 months' East Side trunk sewer notes to the amount of $10,000. H. D. Quinby, city comptroller.

Rochester, N. Y.—Bids for 9,000 ft. 24-in. tile sewer to be laid in bed of old Erie Canal from Washington Ave. to Church St. will soon be received. L. E. Sebring, city engr.

Ashland, O.—City council has passed an ordinance for the issuance of storm sewer bonds, $4,000.

East Cleveland, O.—See "Streets and Roads."

Sandusky, O.—City commission granted permission to the Hord Color Products Co. to build an 8 or 10-in. sewer on the east side of Columbus Ave. to take care of the excess sewage.

Utica, O.—City contemplates issuing sewer bonds for $10,000.

Vermilion, O.—County Eigineer Schultz will have sewer and paving plans of an extensive character ready for contractors early in February. Plans include brick paving, to cost $40,000. Mr. Gascoign, an engineer, Cleveland, consulting engineer.

Warren, O.—Contract let soon for improving a sanitary trunk sewer in subdistrict No. 2 of the Southwestern sewer district. Specifications cover 3,000 ft. of 24-in. standard vitrified sewer pipe, 1,350 ft. of 22-in., 3,350 ft. of 20-in., 1,030 ft. of 18-in., 600 ft. of 15-in., 1,250 ft. of 12-in., 1,330 ft. of 15-in., 1,820 ft .of 15-in. Geo. T. Hecklinger, city clk.

Bristow, Okla.—City votes, Jan. 2, $20,000 bond issue to extend sewerage system.

Milton, Pa.—Borough will advertise for bids about February or March for sewage disposal plant. Alex Potter, 20 Church St., New York City, consulting engr.

Philadelphia, Pa.—Plans and specifications for a number of permanent public improvements, involving expenditure of about $10,000,000, have been drafted under supervision of Director Datesman, of the department of public works. These include construction of bridges, main and branch sewers, elimination of grade-crossings and of the sewage disposal system. It is the intention of the director, as soon as loan funds are released, to put the new work under way. Among the main sewers to be constructed are: Godfrey Ave. from 10th St. to Medary Ave., to Chelton Ave.; B St. from Rosehill St. to Erie Ave, to the Philadelphia & Bustleton Railroad; Indian Creek storm sewer, in 69th St., Girard Ave. to Malvern Ave.; Mifflin St. from Schuylkill River to 32d St.; Pratt St. from Saul St. to Loretta St.; Pollock or Packer St., 30th to 24th St., and to Moyamensing Ave.; Venango St. from Balfour to Aramingo Ave.; Knorr St. from Erdick to Charles St., etc.; $1,200,000 available. Lowland intercepting sewer in the 40th Ward, and the Wissahickon low-level sewer through Fairmount Park from Walnut Lane to Gorgas Lane; $1,500,000 available. The proposed new bridges are: South St., over the Schuylkill River; on the line of 49th St., over the Philadelphia, Baltimore and Wilmington Railroad; Ashburner St., over the Philadelphia & Trenton Railroad; Linden Ave., over the Philadelphia & Trenton Railroad; Convent Lane, over the Philadelphia & Trenton Railroad; Harvey St., under the Philadelphia, Germantown & Norristown Railroad; Mount Airy Ave., over the Chestnut Hill branch of the Philadelphia & Reading Railroad; 34th St., over the Schuylkill River near Grays Ferry Ave.; two bridges over Cobb's Creek Parkway; $725,000 available. For elimination of grade crossings in South Philadelphia, available about $6,000,000. This is a combination improvement in accordance with agreement between the Pennsylvania, the Philadelphia & Reading and the Baltimore & Ohio Railroads and the city, each party paying its share of the cost.

Washington, Pa.—No bids received by borough council for sewers in Second St. and Shirls Ave. David Mossow, engr., Borough Bldg.

Longview, Tex.—City voted in favor of issuing sewer bonds for $25,000. H. C. Bennett, secretary.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Bridgewater, Mass.—*W. H. Connor, 3 Main St., Middleboro, Mass., sewer extension on Ball Ave., $3,000. Ernest L. Leach, chairman of selectmen.

Lansing, Mich.—*E. J. Noyce, for the construction of sewer in Cedar St., from 361 feet south of Marvin drain to south 264 feet; $338. Mayor J. W. Ferle.

Brooklyn, N. Y.—P. J. Donlan Contg. Co., 84 Broadway, $11,397; E. Ghelardi, 2617 Delamire Pl., $12,430; J. Jennings, 3127 Ferris St., Woodhaven, L. I., $13,267, bidders, repairing sewer in 49th St., from First to Second Aves. E. Riegelmann, president, Brooklyn borough.

Long Island City, N. Y.—*Carmine Contg. Co., 800 Kent Ave., Brooklyn, at $14,019, for building sewer in Wool St., from Grand to Weimer Sts.; Koerner St., from Weimer St. to point east of Wool St.; Manheim St., from Weimer St. to point east of Wool St., and Weimer St., from point east to point west of Wool St. M. E. Connolly, president, Queens borough.

Bethlehem, Pa.—*Frank Glassmire, 601 Prospect Ave., for sewers along Lehigh River, $7,500. Engr., R. L. Toy, City Hall.

Brantford, Ont.—See "Streets and Roads."

WATER SUPPLY

Waterbury, Conn.—City considering water mains, Cherry St. to Waterville, $125,000 to $150,000. Engr., R. A. Cairns, City Hall.

Pensacola, Fla.—See "Streets and Roads."

Brunswick, Ga.—U. S. Government has plans drawn for artesian wells, $3,000. C. W. Parks, chief bureau yards and docks, Navy Dept., Washington, D. C.

South West La Grande, Ga.—City Clerk C. L. Smith receiving sealed bids Jan. 10 for the following bonds: Water, $82,000; sewer, $63,000; school, $50,000; electric light, $25,000; street improvement, $10,000.

Blackfoot, Ida.—City defeated the proposition at an election here to issue water works bonds for $95,000. Roy S. De Kay, city clerk.

Clarinda, Ia.—Water works bonds to the amount of $75,000 have been sold to Geo. M. Bechtel & Co., of Davenport.

Hiawatha, Kan.—An election is being planned by commissioners Brown county and city to vote $25,000 bonds to build addition to water plant.

Scott, Kan.—For building water works system, city receiving bids in January. Black & Veatch, 507 Interstate Bldg., Kansas City, Mo., engr.

Boston, Mass.—Boston Elevated Railway Co., room 909, 101 Milk St., Boston, rejected bids for air pipe main on Lavy St.

Manganese, Minn.—Village Clerk J. D. Dimmick receiving bids Jan. 24 for water works bonds of $30,000.

Pinestone, Minn.—For building water works system, city receives bids in January or February, about $77,000. L. P. Wolff, 1000 Guardian Life Bldg., St. Paul, engr.

St. Louis, Mo.—For addition to waterworks system on Missouri river, near Crene Coeur lake, city had preliminary plans prepared; $20,000,000 bond issue has been recommended to city by H. Bartholomew, city engineer. E. E. Wall, 312 City Hall, water commissioner.

Keyport, N. J.—Borough council has authorized the issuance water system bonds, $10,000.

Johnstown, N. Y.—Sealed bids received Jan. 14 for water bonds, $75,000, by Grover E. Yerdon, clk. bd. of water comrs.

Alliance, O.—Consulting Engineer R. Winthrop Pratt has taken up the preliminary work for the plans of the proposed extension of the city waterworks system by the construction of a switch which perhaps will be built from the New York Central Railroad to the pumping station. It is also planned to dredge the Mahoning river for a considerable distance above the present dam.

Bradford, O.—Village Clerk W. Lee Hook receiving bids Jan. 24 for water works extension bonds, $1,400.

East Cleveland, O.—See "Streets and Roads."

Ironton, O.—Mayor Hannon will recommend a larger water main into the south side district.

New Lexington, O.—The council has leased the waterworks plant to J. F. Cole, of South Bend, Ind. New wells will be drilled and extensions of the system made.

Wooster, O.—Service Director Harry Miller is in correspondence with several firms relative to the waterworks improvements here and it is the belief of city officials that prices can be secured which will warrant the city going ahead and putting up a first-class waterworks plant on the ground owned west of the city.

Bristow, Okla.—$15,000 bonds, to extend waterworks, will be voted on by city, Jan. 2.

Freeport, Pa.—Borough plans construction waterworks plant.

Marshall, Tex.—City, at an election here, voted in favor of $10,000 water bonds. H. S. Rice, secretary.

Seattle, Wash.—The special committee, composed of the mayor, corporation counsel and chairman of finance committee, were authorized to apply to the capital issues committee for its approval of the issuance and sale of $500,000 of the $3,700,000 utility bonds heretofore authorized for water extensions, and a resolution asking for approval of $750,000 of the $1,755,000 utility bonds for light and power extensions was introduced and referred to the finance and city utilities committee.

St. James, Man.—It has been proposed to construct extension of water works system at a cost of $4,000.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

San Francisco, Cal.—*Schultz Constr. Co., 46 Kearney St., San Francisco, at $4,841.78, building reservoir U. S. Government. C. W. Parks, chief bureau yards and docks, Navy Dept., Washington, D. C.

Yonkers, N. Y.—*William McVicar, 759 Palisade Ave., for water works system improvements. Bd. of contract and supply, C. J. Schlisman, secy., City Hall.

Milwaukee, Wis.—H. Hohensee, 965 27th St., building 2 steel-lined concrete shafts 181 ft. long, 10 ft. inside diameter, 1 west side West Water St. and north Menominee River, 1 west side Reed St., south Menominee River; reinforced concrete lined tunnel 268 ft., 7x9 ft. inside diameter underneath bed of Menominee River between above shafts and west of present bascule bridge; placing 440 ft. 24-in. c.-i. water pipe line in said shafts and tunnel; 765 ft. 20-24-in. c.-i. pipe laid in trenches from shafts to connecting mains in Reed and 3d Sts. About $80,427. Board pub. works.

LIGHTING AND POWER

Fort Payne, Ala.—Citizens voted electric light and town hall bonds, $14,000. Tom Sawyer, mayor.

Sterling, Colo.—Plans for the erection and operation of a municipal power plant here are under consideration by the city council.

South West La Grande, Ga.—See "Water Supply."

Buck Grove, Ia.—The city council is considering calling an election to vote on the proposal to issue bonds for the installation of a complete new plant.

Fort Dodge, Ia.—The Minneapolis & St. Louis Railway Co., of Minneapolis, Minn., is contemplating the construction of a terminal plant in Fort Dodge, including engine house, machine shop, boiler plant and power house.

Altenburg, Mo.—The Altenburg Light & Power Co. is planning to rebuild its plant, recently destroyed by fire. About $19,000 will be spent for equipment.

Lorain, O.—The big 5,000-kilowatt turbine at the Lorain County Electric Co. plant has been totally destroyed by fire, entailing a loss of $25,000. J. B. Johnson, general manager, states that repairs have been ordered and that a new generator will be installed at once.

Seattle, Wash.—See "Water Supply."

Smith's Falls, Ont.—The Hydro-Electric Power Commission is at present arranging for the installation of two 1,000 imperial gallon centrifugal pumps and one 800 imperial gallon booster pump for the water works system. These units are to be electrically driven by means of hydro power.

Kinistino, Sask.—The citizens have under consideration at the present time plans for an electric lighting system for the village.

FIRE

Maltoon, Ill.—Geo. B. Sean, mayor of this city, states that the project for a fire station to be erected here will mature in the spring. A one-story structure, 16x60 feet, costing $40,000, will be erected.

Kirkwood, Mo.—Plans have been prepared by D. H. Mellen, architect, Chemiol Bldg., St. Louis, Mo., for a new station house to cost $15,000. E. O. Harper, city clerk, states that bids will be taken next spring.

Bridgeport, O.—The issuance of $9,000 fire apparatus bonds considered by city.

Danville, O.—J. W. Johnson, clerk of the village, states that the ordinance creating a fire department for that village has passed the council.

Harrison, O.—Village Clerk L. A. Cook receiving bids Jan. 20 for fire engine bonds, $1,500.

Oklahoma City, Okla.—Mayor Overholser in his council report has recommended an expenditure of $100,000 for the improvement of the fire department.

Toronto, Ont.—The board of control plans to build a fire hall at Ashbridge's Bay. T. McQueen, secretary.

BRIDGES

Coeur D'Alene, Idaho—Shoshone county commissioners appropriated $8,000 toward the construction of a new bridge across the Coeur d'Alene river at Cataldo; cost, $24,000. Of this amount the state highway commission has agreed to contribute $8,000, and Kootenai county, in which the bridge is located, has appropriated $8,000.

Elizabeth, N. J.—Reconstruction of a number of culverts, particularly in St. George Ave., between Elizabeth and Rahway, is one item of the 1919 program of the county engineering department. County Engineer J. L. Bauer and the roads committee of the board of freeholders are now considering the various road, bridge and culvert improvements which can be undertaken in the spring.

Egg Harbor, N. J.—Plans drawn will take new bids April 1 for building $10,000 bridge over Indian Cabin Creek. Engineer, A. H. Nelson, Guarantee Trust Bldg., Atlantic City.

Windsor, N. J.—Mercer county having plans drawn building bridge Windsor-Sharon road, near Windsor, $7,000. H. Harris, Court House, engr.

Philadelphia, Pa.—See "Sewerage."

Seattle, Wash.—The Great Northern Railway Co. will repair the Jackson St. bridge between 3d and 4th Aves. in the near future. The work will be handled by the railroad company by day labor.

Vancouver, B. C.—The construction of steel bridge over Second Narrows is contemplated by the city council. R. Archibald, clerk.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Hattiesburg, Miss.—*Munson & Welborn, this city, for constructing bridge 3 miles from Brooklyn, at $3,000.

Kinston, N. C.—*Roanoke Iron & Bridge Works, Roanoke, Va., for constructing steel highway bridge with draw span across Neuse River at Oak Bridge site, 6 miles from Kinston, 312 ft. in length with a 16-ft. roadway, conerete abutments and piers, at $26,607.

Fredericton, B. C.—*D. C. Burpee & Son, South Devon, for building bridge costing $29,000. Dept. of pub. works.

MISCELLANEOUS

Washington, D. C. (Bureau of Foreign and Domestic Commerce, Department of Commerce)—The management of the Cantonal Street Railway in a city of Switzerland desires to purchase a supply of 300 to 600 tons groved rolled-steel rails, 15 meters long, straight and partly curved; also a supply of 50 pairs of fishplates 800 mm. long. Profile height of rails to be about 180 mm. Drawings may be seen at the bureau or its district offices. (Refer to file No. 108696). A statement of the tensile strength and expansion of material and detailed plans of the crosscut of the rails and fishplates are desired. The delivery is to be made in July, 1919. Quality and durability of the rails and fishplates to be guaranteed for a period of five years. Offers will be received until Feb. 15, 1919. Cash will be paid within 10 days after receipt of goods in Switzerland. Correspondence should be in German. Refer to Opportunity No. 27881.

Washington, D. C. (Bureau of Foreign and Domestic Commerce, Department of Commerce)—A man in England desires to secure the representation for wire-rope manufacturers. He has a practical knowledge of wire-rope making in all its branches. References. Refer to Opportunity No. 27892.

Washington, D. C. (Bureau of Foreign and Domestic Commerce, Department of Commerce)—An agency is desired by a man in France for the sale of supplies for the manufacture of motor-car bodies, especially leather, varnishes and trim-

mings. Correspondence should be in French. Reference. Refer to Opportunity No. 27902.

Washington, D. C. (Bureau of Foreign and Domestic Commerce, Department of Commerce)—A commission merchant in France desires to secure an agency with stock for the sale of motor cars and motor trucks. Correspondence should be in French. Reference. Refer to Opportunity No. 27891.

Columbia City, Ind.—Bids received, Jan. 15, by trustee of Etna twp., Whitley county, for sale $14,000 school bonds. Edward D. Scott, trustee.

Detroit, Mich.—It will cost the city from $30,000,000 to $50,000,000 to separate all grade crossings and will take from 12 to 15 years to complete the work, according to the report prepared for the common council by Prof. H. E. Riggs, of the engineering department of the University of Michigan, and J. W. Reid, assistant city engineer. The engineers recommend an almost universal elevated system because of topography and suggest co-operation between the city and the railroads. At present 147 Detroit streets lack grade crossings. As a result of no grade crossings, train movements are held up over 8 hours daily.

Detroit, Mich.—City Comptroller Geo. Engle receiving bids Jan. 6 for the following bonds: General public improvebent, $200,000; general public improvement, $165,000.

Duluth, Minn.—St. Louis lets contract soon for county ditch No. 6. O. Halden, auditor.

Milaca, Minn.—Citizens voted in favor of issuing funding bonds, $25,000.

Omaha, Neb.—W. T. Burke, secretary of the board of education, will receive sealed bids, Jan. 6, for $1,000,000 school bonds.

Syracuse, N. Y.—Common council authorized the purchase of the site known as the Municipal Garbage Plant in Hiawatha St., for the erection of a new garbage plant. Equipment and site will cost about $25,000. Plans are being drawn by City Engineer Harry C. Allen. Ground will be broken in the spring.

Canton, O.—Resolution passed the council which provides for the issuance refunding bonds, $83,500.

Celina, O.—Sealed bids received Jan. 14 for the sale refunding bonds, $20,000. Village Clerk J. W. Winter.

Dayton, O.—City Manager Barlow will proceed with plans for a new city station house on Sears St. Citizens have agreed to raise $15,000 as part of the expense in erecting the new building.

Dayton, O.—Because the city lacks sufficient money to build a new station house, Dayton women will raise $15,000, to which will be added a similar amount by the city commission for the purpose of equipping an adequate police station on city owned property adjacent to the municipal garage between Sears and Webster Sts.

Glouster, O.—Village klk. Reuben Wagner will take bids Jan. 15 for refunding bonds, $5,000.

Lima, O.—The Lake Erie & Western Railroad, Indianapolis, Ind., and the city of Lima, A. L. Matheny, director of public service, will be ready for bids April 1 for a grade crossing elimination on Metcalf St., this city, to cost $75,000.

Yorkville, O.—Louis DeRomedis has submitted plans for the construction of a city building to contain rooms for the mayor, officers, a police court and cells, as well as a garage for the fire truck, with recreation rooms for the firemen. It is proposed that the Business Men's Association build the structure at a cost of $17,000 and then rent it to the town.

Bancroft, Ore.—The Umpqua Valley Bank of Roseburg was the successful bidder for an issue of improvement series T bonds, $4,526.75.

Philadelphia, Pa.—See "Sewerage."

Verona, Pa.—S. J. Kier, secretary of the board of school trustees, will receive sealed bids, Jan. 6, for $25,000 school bonds.

Memphis, Tenn.—City Clerk C. C. Pashby will take bids Jan. 7 for 8 months' revenue notes, $750,000.

Regina, Sask.—A memorial hall costing $500,000 will be erected here by the city council. G. Beach, clerk.

TOO LATE FOR CLASSIFICATION

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
			STREETS AND ROADS.	
Tex.,	Dickinson	10 a.m., Jan. 6.	Surfacing state highway with six inches of shell, requiring 8,600 cu. yds. of shell and 5.5 mi. of scarifying	John M. Murch, Co. Aud., Galveston, Tex.
Minn.,	Aitkin	10 a.m., Jan. 8.	Surfacing state road	H. C. Beecher, Co. Aud.
Wis.,	Baraboo	8 p.m., Jan. 18.	Building concrete road, involving 21,355 acres excavation, cleaning and grubbing, 2.7 acres concrete paving, 30,683 sq. yds. concrete culverts, etc	H. E. French, City Engr.
			WATER SUPPLY.	
Tex.,	Houston	noon, Jan. 10.	Drilling seven wells with deep well centrifugal pumps, motors, etc., at the central water plant	E. E. Sands, City Engr.
			LIGHTING AND POWER.	
Tex.,	Houston	noon, Jan. 10.	Furnishing one generator complete, with steam turbine condensers and switchboard, to be used at the central water plant	E. E. Sands, City Engr.
			BRIDGES.	
Pa.,	New Castle	Jan. 16.	Construction of a steel bridge over Neshannock creek, with roadway 33 ft. wide, and two sidewalks, each about 7 ft. wide	Thos. A. Gilkey, Engr., New Castle Bldg., New Castle.
Ark.,	Fort Smith	2 p.m., Jan. 22.	Construction of a reinforced concrete arch bridge, and approaches thereto, across the Arkansas river, involving the following items: 20,000 cu. yds. concrete; 1,550,000 lbs. reinforcing steel; 8,270 sq. yds. wood block or asphalt pavement; 25,000 lbs. miscellaneous metal; 22,000 cu. yds. earth embankment	Hedrick & Hedrick, Consulting Engrs., 506 Interstate Bldg., Kansas City, Mo.
			MISCELLANEOUS.	
Tex.,	Houston	10 a.m., Jan. 6.	Furnishing two automobiles for commissioners of precincts in Harris county	Co. Comrs.
Wash.,	Seattle	2 p.m., Feb. 15.	Furnishing and installation of a gantry crane at Smith's Cove improvement pier	T. S. Lippy, Secy., Port Commission, Port of Seattle.

STREETS AND ROADS.

Washington, D. C.—Forty of the larger cities of the country are prepared to spend $122,850,000 in appropriations and bond issues for public works and buildings, according to reports made public by the War Labor Policies Board. Report shows that 12 cities in the eastern district were prepared to spend $46,543,500; 13 cities in the central district, $41,243,720; nine cities in the western district, $30,521,000, and six in the southern district, $4,537,000. Among the cities and the amounts reported were: Seattle, $15,100,000; Spokane, $70,000; Sacramento, Cal., $1,800,000; San Francisco, $3,000,000; Salt Lake City, $1,150,000; Los Angeles, $6,258,000; Tacoma, Wash., $2,455,000; San Diego, Cal., $610,000; Boston, $8,400,000; Buffalo, $6,000,000; Pittsburgh, $5,150,000; Philadelphia, $13,000,000; Syracuse, $2,362,000; Springfield, Mass., $4,015,000; Worcester, Mass., $1,800,000; Manchester, N. H., $290,000; Savannah, Ga., $350,000; Chattanooga, Tenn., $600,000; Memphis, Tenn., $600,000; Atlanta, Ga., $2,212,000; Dayton, Ohio, $750,000; Wichita, Kan., $750,000; Cleveland, O., $8,100,000; Kansas City, Kan., $525,000; Des Moines, $2,200,000; Toledo, O., $2,000,000; Akron, O., $2,500,000; Fort Wayne, Ind., $300,000; Sioux City, Iowa, $475,000; Chicago, $11,100,000; Detroit, $4,300,000.

Detroit, Mich.—Paving Mt. Elliott Ave., from Conant Ave. to the Lynch Rd., somewhat more than a mile, with asphaltic concrete, is among the items Commissioner H. H. Esselstyn will include in the estimates of the department of public works.

Utica, N. Y.—City sold the following bonds to the Mohawk Valley Investment Corporation, of Utica: Street improvement, $15,000; voting machine, $24,000; paving, $17,914.16. Stuart W. Snyder, city comptroller.

Akron, O.—Geo. P. Hoffman, director of public service, will soon advertise for a bond sale for funds to take care of repairing S. Main St., from Thornton to

Crozier Sts., at a cost of $65,000. Approximately 2,450 lin. ft. long, 6,915 sq. yds. of brick paving, 850 lin. ft., 15 to 24-in. drain, 8 catch-basins, 4 manholes. E. A. Zerstope, Delaware Bldg., is engineer.

Circleville, O.—Bids will be taken in the early spring for grading and paving the Columbus-Washington C. H. road I. C. H. No. 50 in Darby township. The work will be done jointly by the commissioners of Pickaway county, T. D. Krimm, auditor, Court House, Circleville, and the State Highway Department, Clinton Cowen, commissioner, Stoneman Bldg., Columbus.

Kenmore, O.—The paving of the north side of Kenmore Blvd. is planned by the city administration.

Lima, O.—Allen county commissioners will endeavor to improve and reconstruct leading market roads in the county in an effort to secure state and federal aid. One of the highways will be the Lima and Findlay road along the Dixie highway.

Hood River, Ore.—The county court has appropriated $2,500 to start work on the Lost Lake road.

Klamath Falls, Ore.—Four hundred and ten thousand dollars is estimated by the county court as necessary to run the county for next year, according to the tentative budget submitted by the commissioners. The three largest items are $100,000 for roads, $50,000 for redemption of warrants and $20,000 for courthouse construction. Sixty of the $100,000 dollars for roads will go for permanent new construction, under the state commission, which is expected to double the fund.

North Bend, Ore.—Action to improve the east ends of California and Virginia Sts. was begun by the city council when a resolution providing for the planking of two stretches of both streets was passed. The estimated cost of the work, which includes decking and some replacement of stringers and caps, is $6,100.

Seattle, Wash.—Board of public works plans to repave First Ave. with brick through the business district; the estimate calls for over 34,000 sq. yds. of surfacing; cost, $177,000; also paving with concrete Leary Ave., at $120,000, and Harbor Ave., $85,000; a total yardage of 27,000 sq. yds.

Chatham, Ont.—City council plans construction of pavements. N. Merritt, clerk.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Seattle, Wash.—Stewart Construction Co., American Bank Bldg., low bidders, at $59,882.10, for the construction of the Tenth Ave. N. E. concrete retaining wall with the necessary approaches.

SEWERAGE.

Scranton, Pa.—City had plans drawn for installing sewer, 21st Ward, $165,516.84. Engineer, Wm. A. Schunk, City Hall, will take bids in the spring.

State College, Pa.—Borough having plans drawn for sewers. Engineer, H. D. Shattuck.

Seattle, Wash.—Plans and specifications were submitted by the city engineer for laying over 6,500 feet of sewer pipe on Hinds St. at an estimated cost of $28,000.

Barrie, Ont.—The construction of sewerage system is contemplated by the council. A. W. Smith, clerk.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Waterloo, Ia.—*Blackhawk Construction Co., Waterloo, for storm sewer, $8,000. By Waterloo Gasoline Engine Co. Engineers, Dure & Co., Moline, Ill.

Sleepy Eye, Minn.—*Wm. D. Eitz, for installing lateral sewer. A. J. Thomas, city recorder.

Syracuse, N. Y.—*Charles Boon, 207 Delphi St., for installing sewer Court St., from 7th North St. to Hood Ave., at $3,446. City engineer, H. Allen, City Hall.

Sarnia, Ont.—*Thos. Grace, 317 Wellington St., for the construction of tile sewers. City council.

WATER SUPPLY.

Bridgewater, Mass.—Bridgewater Co. considers water extension. John Mayo, superintendent, Central Sq.

Wyandotte, Mich.—City sold an issue waterworks bonds, $280,000, to the Harris Trust and Savings Bank, of Chicago. Edward C. Byran, city clerk.

Geneva, Neb.—City lets contract soon for waterworks improvement. Chas. Underwood, clerk.

MUNICIPAL AND CORPORATION BONDS PURCHASED

Correspondence invited from officers of Municipalities and from well-established industrial corporations contemplating new financing.

HORNBLOWER & WEEKS

INVESTMENT SECURITIES

42 BROADWAY NEW YORK

Boston Chicago Detroit Providence Portland, Me.

Established 1888

The Operation of Sewage Disposal Plants

By FRANCIS E. DANIELS, A. M.

No other man in the United States has had so good an opportunity of studying the Sewage Disposal Plants in Operation. As State Inspector for New Jersey, Mr. Daniels has examined and made notes in detail on 66 plants, embracing practically every type that is in actual use.

To those in charge of Sewage Disposal Plants in Operation, this volume will show how the best results can be obtained. Designing engineers will find it valuable because it shows failures and successes due frequently to faulty or good designs and construction.

It is commended universally to Consulting Engineers, City Engineers, Boards of Health, and those in charge of going plants.

Price $1.50 postpaid

Municipal Journal, 243 W. 39th St., New York City

Publishers

Why Waste Time Indexing Your Magazines

Use the

Municipal Index

Published by

Municipal Journal

in the second issue of each month

It covers all periodicals of any importance and is the best and most complete means of locating any article treating of municipal matters that can be obtained.

In preparing this, all articles of interest to city officials, engineers, and contractors engaged in municipal work which have appeared during the previous month in all periodicals of importance are selected, classified, indexed, and described so they can be found quickly.

The subjects covered are Roads and Pavements, Sewerage and Sanitation, Water Supply, Lighting and Power, Fire and Police, Street Cleaning and Refuse Disposal, Traffic and Transportation, Government and Finance, Structural Materials, Bridges, City Planning, etc.

A brief description of the article, name of the author in case of contributed articles, length, number of illustrations, name of periodical in which it appears, and the price of the periodical are given.

Each year the

Municipal Index

is published in book form.

Copies of the 1913, 1914 and 1915 editions are still available. We will send any one for 50c., the regular price, or all three for $1.00. Indices for 1916 and 1917 are $1.00 each—the two for $1.50.

Municipal Journal, 243 W est 39th St., New York, N. Y.

Clear the Streets

This Winter With

THE Martin O.D.&G.CO. REGISTERED

Snow Remover

With the spread of Spanish Influenza it's up to the authorities of every city and community to do everything in their power to conserve the public health. You, the city engineers and city managers, are responsible for the health of the city's people. What better way of preventing colds that end in pneumonia than by keeping the streets clean, well drained and the sidewalks clear of snow, slush and mud? The Martin will do the trick. Will make a healthful town out of your town quicker than you would ever think it could be accomplished. One Martin in your town this winter may be the primary means of saving, say, five lives. What are five lives worth? What is one worth—**yours**, for instance? The value of such service as is rendered by the Martin cannot be reckoned in money—and yet, with all that, the Martin is a most inexpensive little machine. **It does the work.**

Snow Remover in Winter—Ditcher and Road Grader in Summer. The Martin is Useful the Year Around

10 Days' Free Trial

If the Martin fails to do all we claim for it after a fair try-out of 10 days, return it by freight at our expense and we will refund your money.

Write for Book and Prices

Learn all about the Martin and what it will do in snow, slush, mud—in winter and in summer—in city, town and country.

Owensboro Ditcher & Grader Co.

P. O. Box 200

OWENSBORO, KENTUCKY

Martin No. 20
Reversible
Adjustable

OFFICIAL ADVERTISING

"Reaches Most Bidders at the Least Cost"

Rate, $2.00 an inch an insertion

Why pay 50 to 80 per cent. more in other papers? Our results are BETTER. Copy reaching us by 10 A. M. Thursday will go in issue mailed the next day.

TREASURY DEPARTMENT, Supervising Architect's Office, Washington, D. C., December 23, 1918.—SEALED PROPOSALS will be opened in this office at 3:00 P. M., January 13, 1919, for alterations to the United States Post Office and Custom House at Petersburg, Va. Drawings and specifications may be obtained from the Custodian or at this office at the discretion of the Supervising Architect. JAS. A. WETMORE, Acting Supervising Architect.

CALLS FOR BIDS

published under

"Official Advertising"

in

Municipal Journal

Save

Big Money on Contracts and Purchases

Canton, O.—Service Director DeCorps will shortly after Jan. 1 engage the services of an engineer, who will be employed to supervise details of the proposed water system of this city, the cost of which will be $3,500,000. The engineer thus retained would prepare all detail work for the proposed new high level reservoir, the survey of the Dan Smith farm and the sedimentation basin.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Charles City, Ia.—*Blackhawk Construction Co., Waterloo, Iowa, for waterworks plant. By Illinois Central R. R. Co., 12th near S. Michigan Ave., Chicago, Ill.; frame construction; 65 ft. high. Architect, L. M. Booth Co., Nutley, N. J., $3,000.

LIGHTING AND POWER.

Osborne, Kan.—City will purchase a new cylinder for its Muncie engine which will increase the power to 85 h. p.

Dover, N. J.—Application has been made by the New Jersey Power and Light Co. to the Board of Public Utility Commissioners to issue $64,000 bonds, to be used to cover expenditures.

FIRE EQUIPMENT

Natchez, Miss.—Favorable consideration is being given by the city council to the proposition to purchase additional motor apparatus for the fire department; cost, approximately $10,000.

Troy, N. Y.—The council has authorized the issuance of certificates of indebtedness for $70,600, to finance improvements in the department of public safety. These improvements include the purchase of a squad car for the fire department, a hook and ladder tractor and four triple combination pumping engine, chemical and hose wagons. The appropriation provides for alteration of the engine house No. 3, at 3d St. and Canal Ave., for use as a police station in the first precinct, at an estimated cost of $6,000.

Conneaut, O.—C. V. Carr, safety director, has estimated the cost of providing a new truck for the fire department at $8,700. An ordinance to appropriate the sum will be introduced into the council.

Warren, Pa.—An ordinance will be introduced at meeting of the council for a number of necessary repairs to the fire station.

BRIDGES.

Helena, Mont.—The state highway commission will take up the final survey for the $150,000 bridge over the Yellowstone River at Huntley at an early meeting. M. S. Curran, assistant engineer of the state highway commission, is working on the final survey. The cost will be equally borne by the Government and Yellowstone county.

Bryan, O.—G. C. Benchler, auditor of Williams county, will shortly invite bids for bridges to cost about $10,000. Bert Beuchler is the engineer.

Elyria, O.—Engineer F. P. Crosse is drawing plans for a bridge to be erected in Rochester township to cost about $10,000. It will soon be advertised.

Carman, Man.—Town council contemplates the construction of a bridge over the Boyne river. A. Malcolmson, clerk.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Wellington, O.—*Capital Construction Co., Reynolds Ave., Columbus, for the superstructure of a bridge to be erected here at $7,000. Commissioners of Lorain county.

MISCELLANEOUS.

Porterville, Cal.—At a call of Mayor W. S. Sibley a special meeting of the city council was held with representatives of the Chamber of Commerce, Business Men's Association and Southern Pacific and Santa Fe systems, to devise a comprehensive plan for protection of this city and district from high water from the Tule river. Wing dams of concrete and stone and a levee of substantial construction along the northern bank of the river for a considerable distance are, engineers believe, the best projects to be completed as emergency measures.

Washington, D. C. (Bureau of Foreign and Domestic Commerce, Department of Commerce)—A purchasing agent of a state railway in Australia desires to purchase painting machines for railway and bridge work. Catalogues are requested. Quotations should be made f. o. b. New York or San Francisco. Refer to Opportunity No. 27890.

Seattle, Wash.—City receiving bids, Feb. 1, for the sale $400,000 bonds, to provide finances to take care of the immediate construction of the west end of the municipal elevated railway. H. W. Carroll, city comptroller.

Brantford, Ont.—The city council contemplates the extension of street railway to Terrace Hill at a cost of $135,000. T. H. Jones, engineer.

When in Immediate Need of Machinery, Equipment or Supplies

Publish Your Wants under

"Equipment Bargains"

And in short order you will get details and prices of good used equipment that other readers have for sale.

EQUIPMENT BARGAINS

HOISTING ENGINES

	Price
1—6¼x10 American DCDD, with boiler	$1,000
1—7x10 Lidgerwood DCDD, with boiler	1,100
1—7x10 Lambert, 3 drums, with boiler	1,000
1—8x12 Mundy DCDD, with boiler	1,200
1—9x10 Lidgerwood, 3 drums, 32" drums, without boiler	1,000
With boiler	2,200
1—8x8 DCDD Reversible Odell, with vertical engine, without boiler	350
With boiler	550
1—7x10 Lambert DCDD, with boiler	1,100

COMPRESSORS

	Price
1—12x12 Laidlaw-Dunn-Gordon, belt driven, capacity 300'	$750
1—13x13x16 Ingersoll, straight line, steam driven, capacity about 300' at 80 to 100 lbs.	900
1—Sullivan, 2 stage air, simple steam, capacity 1200' at 80 to 100 lbs.	2,200
2—14x12 Bury Duplex, belt driven, capacity about 550' at 60 to 80 lbs., each	1,000
1—14x16x16x16 Sullivan, 2 stage air, simple steam, capacity 900' at 60 to 100 lbs.	1,500
1—14x8x10 Bury, 2 stage, belt driven, capacity 350'	1,500
1—Ingersoll-Rand Imperial Type XB3, 300'	2,000

DRAGLINES

	Price
1—Monighan-Walker steam machine, with 50' boom, 1¼ yd. bucket, almost new	$7,000
1—Flory swift engine 18x13 heavy dragline type boiler, firebox 160 lb. pressure; boom, 60'; steel bucket, 2 yd.; new, 1917	9,000
1—24 Bucyrus, with 80' boom	——

Machinery Warehouse & Sales Co.
791 Old Colony Bldg., Chicago, Illinois

Rates

Equipment Ads

1 inch—$2.50
4 inches—$2.40 an inch
8 inches— 2.30 an inch
15 inches— 2.20 an inch
30 inches— 2.10 an inch
98 inches— 2.00 an inch

Proposal Ads

$2.00 an inch an insertion

FIRST—Get Bulletin 250—or, Wire
ZELNICKER IN ST. LOUIS
Before buying or selling
RAILS
Locomotives, Cars, Tanks, Machinery, Piling, Etc.
What have you for sale?

PROPOSAL ADS in Municipal Journal Bring Results

Your Ad.

Why Isn't It Here?

IT would attract attention and bring inquiries.

There must be something that you want to Buy, Sell, Rent or Exchange.

A space of this size costs but $9.60 or less, smaller spaces for even less money. See rates at top of page.

Books on Organization, Management, Economics

Engineering Office Systems and Methods.

By John P. Davies, M. E.

A practical book devoted to the systems and methods of the modern engineering office. Covers every detail likely to arise in daily office routine. Forms and directions are given, as well as a comprehensive treatment of the various problems the engineer may be obliged to meet. 554 pp.; 243 illustrations. $5.00 net.

Cost Keeping and Scientific Management.

By Holden A. Evans.

Especially adapted for the small contractor or manufacturer. It applies scientific management to the plant of ordinary equipment. Covers purpose, elements, distribution and records of cost. 260 pp. $3.00.

Purchasing.

By C. S. Rindsfoos.

Covers completely and in a practical manner the important features of the subject. 165 pp. $2.00.

Electric Light Accounts and Their Significance.

By H. M. Edwards.

Gives in detail a system of accounts for electric lighting companies. 172 pp. $2.00.

Value for Rate Making.

By Henry Floy.

This book emphasizes the principles that are essential in determining the fair value to use in fixing rates. It defines methods and standardizes practices in valuation procedure. 322 pp. $4.00 net.

Municipal Franchises.

By Delos F. Wilcox.

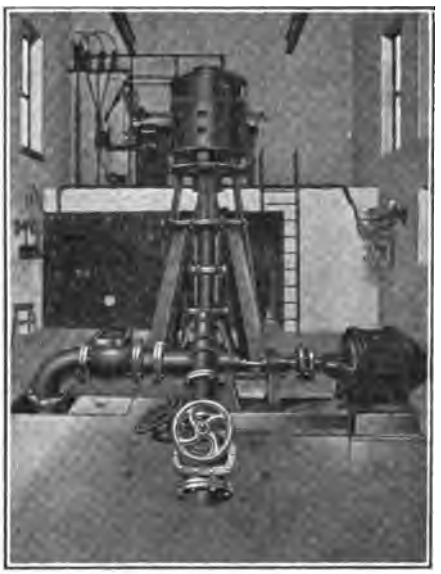
A broad treatment of principles and a careful study of the special problems of a large number of typical American cities, based on unusual experience and a life-long study of these problems. Volume I, Pipe and Wire Franchises, 710 pp.; $5.00. Volume II, Transportation Franchises; Taxation and Control of Public Utilities. 885 pp. $5.00.

Order from MUNICIPAL JOURNAL, 243 W. 39th St., New York City

WATER WORKS EQUIPMENT

"Turnkey Jobs"

Our Service is Complete, as our organization includes Engineers, Field Construction Forces and Factory Facilities which puts the burden of getting results on us—Hence the Guarantee



"Water, or No Pay"

We Write It in the Contract

Write today for Information and Free Literature.

Layne & Bowler Company

"World's Largest Water Developers."

759 Randolph Building
Memphis, Tenn.

SERVICE AND FIRE PROTECTION

Layne Deep Well Turbine Pump ordinarily operating against service pressure by-passing horizontal Turbine. Horizontal Turbine is cut in for fire pressure.

ABSOLUTE RELIABILITY AND OPERATING ECONOMY ARE THE MOST ESSENTIAL REQUIREMENTS OF

PUMPING ENGINES

The great number of Allis-Chalmers Pumping Engines in continuous service, 365 days a year, demonstrates their reliability.

Official duty tests and published annual reports of station operating costs prove their HIGH ECONOMY.

Is There Any Municipal Problem of Greater Importance Than the Water Supply of a City?

Allis-Chalmers Manufacturing Company

Pumping Engine Department, Milwaukee, Wis.

For all Canadian business refer to Canadian Allis-Chalmers, Limited, Toronto, Ont.

FOREIGN REPRESENTATIVES:

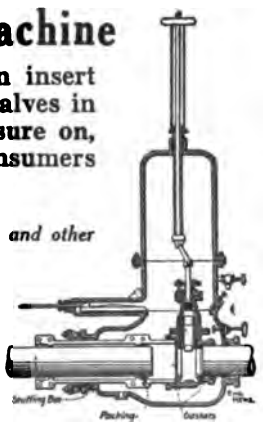
Frank R. Perrot, 883 Hay Street, Perth, W. A.
Frank R. Perrot, 204 Clarence Street, Sydney, N. S. W.
H. L. Keen, 732 Salisbury House, London Wall, E. C., England
W. R. Judson, Huerfanos 1157, Casilla 2653, Santiago, Chile

Valve Inserting Machine

With this machine you can insert new and cut out defective valves in water mains with full pressure on, avoiding annoyance to consumers and increased fire risks.

Write for complete description of this and other water works specialties.

See Sweet's Catalogue, Engineering Edition, for Details and Particulars.



THE A. P. SMITH MFG. CO.
EAST ORANGE, N. J.

GRAVITY and PRESSURE FILTERS

Send for Bulletin No. 15

Hypochlorite Apparatus and Water Softening Plants

THE NEW YORK CONTINENTAL JEWELL FILTRATION COMPANY

111 W. Monroe St., CHICAGO — NUTLEY, NEW JERSEY
Inter-State Bldg., KANSAS CITY — New Birks Bldg., MONTREAL

Meter Boxes
Meter Testing Machines and Accessories

STANDARD EVERYWHERE
Send for detailed information

FORD METER BOX COMPANY, Wabash, Ind.

SLUICE GATES

Shear, Flap and Butterfly Valves

FLEXIBLE JOINTS

COLDWELL-WILCOX CO

Box 574 — NEWBURGH, N. Y.

DIRECTORY OF CONSULTING ENGINEERS

Engaged in Municipal and Public Works

ALVORD, JOHN W.
BURDICK, CHAS. B.
Consulting Engineers
Reports, Investigations, Plans and Specifications for Water Supplies, Water Purification, Water Power, Sewerage, Sewage Disposal.
Hartford Building, Chicago

THE AMERICAN APPRAISAL CO.
Milwaukee New York
Authoritative Reports and Valuations Covering Public Utility, Municipal Mineral, Industrial, Commercial and Residence Properties.

BLACK & VEATCH
Consulting Engineers
Inter-State Bldg., Kansas City, Mo.
Sewerage, Sewage Disposal, Water Supply, Water Purification, Electric Lighting, Power Plants, Valuations, Special Investigations, Reports.
E. B. Black N. T. Veatch, Jr.

BROSSMAN, CHAS.
Consulting Engineer
Merchants' Bank Building, Indianapolis, Ind.
Water Supply, Sewerage and Disposal. Lighting Plants—Supervision of Construction and Operation. Appraisals—Expert Testimony.

BURNS & McDONNELL
Consulting Engineers
Appraisals Rate Investigations
Expert Testimony Water Works
Sewerage Lighting
Clinton S. Burns R. E. McDonnell
Kansas City Inter-State Bldg.

CAIRD, JAMES M.
Assoc. Am. Soc. C. E.
Chemist and Bacteriologist
Office and Laboratory:
271 River Street, Troy, N. Y.
Water Analysis and Tests of Filter Plants

COLLINS, JOHN L.
Consulting Civil and Sanitary Engineer
WATER SUPPLY and PURIFICATION
SEWERAGE and SEWAGE DISPOSAL
Plans, Estimates and Supervision of Construction
30 Church Street, New York City

DOW & SMITH
Chemical Engineers
Consulting Paving Engineers
A. W. Dow, Ph.B. F. P. Smith, Ph.B.
Mem. Am. Inst. Ch. Engrs.
Mem. Am. Soc. Civ. Engrs.
Asphalt, Bitumens, Paving, Hydraulic Cement. Engineering Materials.
131-3 East 23d Street, New York

HAZEN, WHIPPLE & FULLER
Consulting Hydraulic and Sanitary Engineers, Water Supply, Sewerage, Drainage, Valuations, Supervision of Construction and Operation.
ALLEN HAZEN G. C. WHIPPLE
W. E. FULLER F. F. LONGLEY
C. M. EVERETT L. N. BABBITT
H. MALCOLM PIRNIE
30 East 42d Street, New York City

Make 'Em Sit Up and Figure!

When bids are wanted, see that your ad gets in more than the local paper. Use your influence to get it in the Official Advertising columns of the national weekly engineering and contracting paper, MUNICIPAL JOURNAL.

Only a local ad leaves you powerless to smash exorbitant local prices.

You need a paper with a national circulation, one concentrated upon this particular field. That paper is MUNICIPAL JOURNAL, the logical medium for your calls for bids.

Your ad in this paper will bring bids from reliable firms all over the United States. They want to bid but cannot do so intelligently unless they have the details, just as the local men have.

Get your ad in this live paper. 'Twill prove a competition stimulator that will make your local men sit up and take notice.. Wake 'em up! Show 'em you're wise to their game. Make 'em sharpen their pencils and figure.

You'll save a heap, and the cost of this "price cutter" is only $2 an inch.

MUNICIPAL JOURNAL
243 W. 39th St., New York

HERING, RUDOLPH, D.Sc.
Consulting Engineer
Water Supply, Sewage and Refuse Disposal
170 Broadway, New York City
Telephone—Cortlandt 6309

HOWARD, J. W.
Consulting Engineer
Pavements and Roads
LABORATORY ANALYSES AND TESTS OF ALL MATERIALS
CONSTRUCTION INSPECTED
30 YEARS' EXPERIENCE
1 Broadway, New York City

KNOWLES, MORRIS
M. Am. Soc. C. E.
Consulting Municipal Engineer
Planning and Construction of Industrial Towns
Water Supply, Water Purification, Sewerage and Sewage Disposal
1200 B. F. Jones Bldg., Pittsburgh, Pa.

MORSE, WILLIAM F.
Consulting Sanitary Engineer
90 West Street, New York City
Surveys, Reports, Specifications, Proposal Forms for Disposal of Waste of Municipalities, Institutions and Business Establishments, Designs for Special Furnaces for any purpose. Expert Investigation and Reports on Any Question of Waste Collection or Disposal.

POLLOCK & TABER
Consulting Engineers
Pavements, Highways, Water Supply, Drainage, Sewerage and Sewage Disposal. Designs, Specifications and Supervision.
Clarence D. Pollock } Members
George A. Taber } Am. Soc. C. E.
Park Row Bldg., New York City

POTTER, ALEXANDER
50 Church Street, New York City
Civil and Sanitary Engineer
Specialties:
Water Supply, Sewerage and Pavements

TAYLOR, HENRY W.
154 Nassau Street, New York City
100 State Street, Albany, N. Y.
Consulting Engineer
Water, Sewerage, Trade Wastes, Pumping Plants

Roads, Pavements, Sewerage and Sewage Disposal, Town Planning

CHAS. R. WARD Engineering Corporation
32 Court Street, Brooklyn, New York
Consulting, Designing and Constructing Engineers
Surveys, Reports, Plans, Specifications Inspection and Supervision

BUYERS' CLASSIFIED DIRECTORY

of Names and Addresses of Firms from Whom to Buy Materials, Appliances and Machinery Needed by Municipal Departments and Contractors

Building Stone

*Badger Crushed Granite Co., 133 W. Washington St., Chicago, Ill.

Cement

Atlas Portland Cement Co., 30 Broad St., N. Y.
*Lehigh Portland Cement Co., Allentown, Pa.

Contractors' Equipment

(See Paving Machinery also.)

CRANES AND HOISTS.

The Brown Hoisting Machinery Co., Cleveland, Ohio.
*Machinery Warehouse & Sales Co., Old Colony Bldg., Chicago, Ill.

DUMPING BUCKETS.

Stuebner, G. L., Iron Works, Hancock St., Long Island City.

DUMPING CARS AND CARTS.

*Koppel Industrial Car & Equipment Co., Koppel, Beaver County, Pa.
*Lee Loader & Body Co., 2343 S. La Salle St., Chicago, Ill.

MOTOR TRUCKS, DUMPING.

*Duplex Truck Co., Lansing, Mich.
*Kissel Motor Car Co., 570 Kissel Ave., Hartford, Wis.

PUMPS, DIAPHRAGM.

*Parker, A. A., Waterford, N. Y.

DANGER SIGNALS.

*A. G. A. Railway Light & Signal Co., Elizabeth, N. J.
*The Automatic Signal & Sign Co., Canton, O.

Fire Dept. Equipment

COMBINATION CHEMICAL AND HOSE WAGONS.

*American-La France F. E. Co., Elmira, N. Y.
*Kissel Motor Car Co., 570 Kissel Ave., Hartford, Wis.

FIRE ALARMS SYSTEMS.

*Loper Fire Alarm Co., Stonington, Conn.

FIRE ALARM TELEGRAPH.

*Gamewell Fire Alarm Telegraph Co., Grand Central Terminal, N. Y.

FIRE HOSE.

*Fabric Fire Hose Co., Duane & Church Sts., New York.
*B. F. Goodrich Rubber Co., Akron, O.

PUMPING ENGINES, GASOLENE.

*American-La France F. E. Co., Elmira, N. Y.

RUBBER TIRES.

*United States Rubber Co., 1790 Broadway, N. Y.

TRACTORS.

*Couple Gear Freight-Wheel Co., 485 Buchanan Ave., Grand Rapids, Mich.

TRIPLE COMBINATION MOTOR.

*American-La France F. E. Co., Elmira, N. Y.

Paving Machinery

ASPHALT PLANTS.

*Cummer & Son Co., Cleveland, O.
*East Iron & Machine Co., Lima, O.
*Hetherington & Berner, Indianapolis, Ind.
*Warren Bros. Co., Boston, Mass.

CONCRETE MIXERS.

*Koehring Machine Co., Milwaukee, Wis.
*Northwestern Steel & Iron Works, Eau Claire, Wis.
*Ransome Concrete Machinery Co., 1754 2d St., Dunellen, N. J.

OIL DISTRIBUTORS.

*Austin Western Road Mach. Co., Chicago, Ill.
*The Kinney Mfg. Co., 3529 Washington St., Boston, Mass.

ROAD GRADERS.

*Austin-Western Road Mach. Co., Chicago, Ill.
*Koehring Machine Co., Milwaukee, Wis.
*F. B. Zieg Mfg. Co., Fredericktown, O.

ROAD ROLLERS.

*Austin-Western Road Mach. Co., Chicago, Ill.

SCRAPERS.

*Austin-Western Road Mach. Co., Chicago, Ill.

TAR KETTLES, ASPHALT HEATERS, ETC.

*Littleford Bros., Cincinnati, O.
*Warren Bros. Co., 142 Berkeley St., Boston.

Paving Materials

ASPHALT.

*Bitoslag Paving Co., 90 West St., N. Y.
*Standard Oil Co., 26 Bway., N. Y.
*Standard Oil Co., 72 W. Adams St., Chicago.
*U. S. Asphalt Refining Co., 90 West St., N. Y.

BINDERS.

*Barrett Co., The, 17 Battery Pl., N. Y.
*Marden, Orth & Hasting Corp., 136 Liberty Street, New York City.
*Standard Oil Co., 26 Broadway, N. Y.
*U. S. Asphalt Refining Co., 90 West St., N. Y.

BITUMINOUS PAVEMENTS.

*Badger Crushed Granite Co., 133 W. Washington St., Chicago, Ill.
*Barrett Co., The, 17 Battery Pl., N. Y.
*Warren Bros. Co., 142 Berkeley St., Boston.
*Willite Road Construction Co., Inc., 51 Chambers St., New York City.

BRICK.

*Terre Haute Vitrified Brick Co., Terre Haute, Ind.
*Thornton Fire Brick Co., 909 Goff Bldg., Clarksburg, W. Va.

EXPANSION JOINTS.

*Barrett Co., The, 17 Battery Pl., N. Y.

OIL.

*Barrett Co., The, 17 Battery Pl., N. Y.
*Indian Refining Co., 244 Madison Ave., N. Y.
*Standard Oil Co., 26 Broadway, N. Y.
*Standard Oil Co., 72 West Adams St., Chicago, Ill.
*U. S. Asphalt Refining Co., 90 West St., N. Y.

PAVING BLOCK.

*Badger Crushed Granite Co., 133 W. Washington St., Chicago, Ill.

WOOD PAVING BLOCKS.

*Wyckoff Pipe and Creosoting Co., 30 E. 42d St., N. Y.

Public Lighting

INSULATED WIRES AND CABLES.

*Okonite Co., 253 Broadway, N. Y.

Scientific Instruments

ENGINEERS' TRANSITS AND LEVELS.

Heller & Brightly, 1124 Spring Garden, Philadelphia, Pa.

BLUEPRINT MACHINES.

*Wickes Bros., Dept. E, Saginaw, Mich.

Sewerage

CULVERT FORMS.

*Northwestern Steel & Iron Works, Eau Claire, Wis.

PIPE (CAST IRON).

*Central Foundry Co., 90 West St., N. Y.
*Warren Foundry & Machine Co., 11 Broadway, N. Y.

PIPE CLEANING MACHINES.

*Champion Potato Machine Co., Hammond, Ind.
*W. H. Stewart, 131 George St., Boston, Mass.

PIPE JOINT COMPOUND.

*Pacific Flush Tank Co., Chicago and New York.
*Standard Paint Co., New York City.

EJECTORS.

*Pacific Flush Tank Co., Chicago and New York.

NOZZLES.

*Pacific Flush Tank Co., Chicago and New York.

PLANTS.

*The Sanitation Corporation, 50 Church St., N. Y.

SEWAGE—SCREENS.

*The Sanitation Corp., 50 Church St., N. Y.

SEWAGE DISINFECTION.

*Electro Bleaching Gas Co., 19 East 41st St., N. Y.

RODS.

*The F. Bissell Co., Toledo, O.
*W. H. Stewart, 131 George St., Boston, Mass.

SIPHONS AND FLUSH TANKS.

*Pacific Flush Tank Co., Chicago and New York.

VITRIFIED FIRE CLAY SEWER TILE.

East Ohio Sewer Pipe Co., Irondale, O.

Street Cleaning And Refuse Disposal

CARTS, SANITARY.

*Geo. H. Holzbog & Bro., Jeffersonville, Ind.

MANHOLES—CATCH BASINS.

*Wm. E. Dee Co., 30 N. La Salle St., Chicago, Ill.
*Odorless Sewer Basin Co., Youngstown, O.

INCINERATORS.

*Stacy-Bates Co., McKnight Bldg., Minneapolis, Minn.

SNOW PLOWS.

*Owensboro Ditcher & Grader Co., P. O. Box 200, Denver, Colo.

SPRINKLING WAGONS AND FLUSHERS.

*Austin Western Road Mach. Co., Chicago, Ill.
*Tiffin Wagon Co., Tiffin, Ohio.

STREET SWEEPERS.

*Austin Western Road Mach. Co., Chicago, Ill.
*Elgin Sales Company, New York and Chicago.

Street Signs

*A. G. A. Railway Light & Signal Co., Elizabeth, N. J.
*The Automatic Signal & Sign Co., Canton, O.

*Advertisers—See Alphabetical Index on last white page.

BUYERS' CLASSIFIED DIRECTORY

Water Works

AIR COMPRESSORS.
*Machinery Warehouse & Sales Co., Old Colony Bldg., Chicago, Ill.
*Sullivan Machy. Co., 122 S. Michigan Ave., Chicago, Ill.

AIR LIFT PUMPS.
*Sullivan Mchy. Co., 122 S. Michigan Ave., Chicago, Ill.

CHLORINE, LIQUID.
*Electro Bleaching Gas Co., 19 East 41st St., N. Y.

CORPORATION AND STOP COCKS.
*Glauber Brass Mfg. Co., Cleveland, O.

DEEP WELL PUMPS.
*Cook, A. D., Lawrenceburg, Ind.
*Layne & Bowler Co., 1117 Exchange Bldg., Memphis, Tenn.

DISINFECTING CHEMICALS.
*Electro Bleaching Gas Co., 19 East 41st St., N. Y. C.

FILTERS.
*N. Y. Continental Jewell Filtration Co., Nutley, N. J.
*Pittsburgh Filter Co., Pittsburgh, Pa.
*Roberts Filter Co., Darby, Pa.

FILTRATION PLANTS.
*Pittsburgh Filter Co., Pittsburgh, Pa.
*Roberts Filter Co., Darby, Pa.

FLAP VALVES.
*Coldwell-Wilcox Co., Newburgh, N. Y.

METERS.
*Hersey Mfg. Co., South Boston, Mass.
*Pittsburgh Meter Co., East Pittsburgh, Pa.
*Thomson Meter Co., 110 Bridge St., Bklyn.
Union Water Meter Co., 83 Hermon St., Worcester, Mass.

METER BOXES.
*Ford Meter Box Co., Wabash, Ind.
*Pittsburgh Meter Co., East Pittsburgh, Pa.

METER TESTING MACHINES.
*Ford Meter Box Co., Wabash, Ind.
*Pittsburgh Meter Co., East Pittsburgh, Pa.

PIPE, CAST IRON.
*Amer. Cast Iron Pipe Co., First National Bank Bldg., Chicago, Ill.
*Central Foundry Co., 90 West St., N. Y.
*Clow, Jas. B., & Sons, 544 S. Franklin St., Chicago, Ill.
*Donaldson Iron Co., Emaus, Lehigh Co., Pa.
*Glamorgan Pipe & Foundry Co., Lynchburg, Va.
*Lynchburg Foundry Co., Lynchburg, Va.
*Massillon Iron & Steel Co., Massillon, O.
*Standard Cast Iron Pipe & Foundry Co., Bristol, Pa.
*U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J.
*Warren Foundry & Machine Co., 11 Broadway, N. Y.
*Walter A. Zelnicker Supply Co., St. Louis, Mo.

PIPE, STEEL.
*East Jersey Pipe Corporation, Fulton and Church Sts., N. Y.

PIPE, WOOD.
*Wyckoff Pipe & Creosoting Co., 80 E. 42d St., N. Y.

PUMPS.
*Allis-Chalmers Mfg. Co., Milwaukee, Wis.
*Cook, A. D., Lawrenceburg, Ind.
*Dayton, Dick, Co., Quincy, Ill.
*Luitwieler Pumping Engine Co., Rochester, N. Y.

SCREENS FOR WELLS.
*Cook, A. D., Lawrenceburg, Ind.
*Layne & Bowler Co., 1117 Exchange Bldg., Memphis, Tenn.

SHEAR VALVES.
*Coldwell-Wilcox Co., Newburgh, N. Y.

SLEEVES AND VALVES.
*Smith, A. P., Mfg. Co., East Orange, N. J.

SLUICE GATES.
*Coldwell-Wilcox Co., Newburgh, N. Y.

STRAINERS.
*Cook, A. D., Lawrenceburg, Ind.

TAPPING MACHINES.
*Smith, A. P., Mfg. Co., East Orange, N. J.

VALVES.
*Flower-Stephens Mfg. Co., 105 Parkinson St., Detroit, Mich.
*Glauber Brass Mfg. Co., Cleveland, Ohio.

WASTE DETECTION.
*The Pitometer Co., 27 Elm St., N. Y.

WATER MAIN CLEANING.
National Water Main Cleaning Co., 50 Church St., N. Y.

WATER PURIFICATION.
*Electro Bleaching Gas Co., 19 East 41st St., N. Y.
*N. Y. Continental Jewell Filtration Co., 15 Broad St., N. Y.

WATER STERILIZATION.
*Electric Ozone Sterilizer Co., 726 Monadnock Block, Chicago, Ill.
*Electro Bleaching Gas Co., 19 East 41st St., N. Y.

WATER STERILIZING APPARATUS.
*Wallace & Tiernan Co., 349 Broadway, N. Y.

WATER SUPPLY FROM WELL SYSTEMS.
*Cook, A. D., Lawrenceburg, Ind.

WELL DRILLS.
*Layne & Bowler Co., 1117 Exchange Bldg., Memphis, Tenn.

Northwestern Steel Forms

NORTHWESTERN STEEL FORMS

For speedy, economical construction of tile culverts, sewers, drains, flumes, etc. Simple, reliable, low in price; a shape and size for every practical purpose. Recognized as standard; used and recommended by leading engineers, road builders and cement workers everywhere. Valuable information about concrete tile and culverts, crushing strains and stresses can be obtained free by asking for Bulletin 22.

NORTHWESTERN STEEL & IRON WORKS
(Capital $200,000) EAU CLAIRE, WISCONSIN

SEWER CLEANING MACHINERY
Ask for Catalog and Price
CHAMPION POTATO MACHINERY CO.
332 CHICAGO AVE. HAMMOND, INDIANA

THIS
The Sanitary Way
or
the Old
Germ Breeder
OR THIS

ODORLESS SEWER BASINS
mean better public health and a saving in labor and time in cleaning.
ODORLESS SEWER BASIN CO.
YOUNGSTOWN, OHIO

AUTOMATIC
MILLER SIPHONS
SAVE LABOR
FOR FLUSHING SEWERS AND DISPOSAL PLANTS
FREE ILLUSTRATED CATALOGS
PACIFIC FLUSH-TANK CO.
CHICAGO, ILL. NEW YORK

Blueprints

The Wickes

Continuous Electric. Sells at half the price. Uses half the current of others. Perfect prints up to 48" in width and of unlimited length.

Wickes Bros.
Department E
Saginaw - Mich.

City sewage dumped at a bathing beach without pollution after treatment by Riensch-Wurl Screens.

Full particulars to Engineers, Architects and City Officials in Bulletin G-4.

THE SANITATION CORPORATION
50 CHURCH STREET NEW YORK CITY

THE X-RAY FOR PUBLIC WATER SYSTEMS

DID YOU SEE OUR AD
IN THE ISSUE OF DEC. 14th?
It told a story of water waste and the means of preventing it by a COLE RECORDER.
Write for particulars

The Pitometer Company
27 Elm Street NEW YORK

COTTON RUBBER LINED
Wax and Para Gum Treated **FIRE HOSE**
MILDEW AND ROTPROOF
FABRIC FIRE HOSE MANUFACTURING CO
Cor. Duane and Church Streets NEW YORK

"STEWART SEWER CLEANING MACHINE"
"Used in nearly every State in the Union"
SEWER RODS
We pay freight and ship for trial. Who else will do it?
W. H. STEWART, 1614 Locust St., ST. LOUIS, MO. 133 George St., BOSTON, MASS.

Is Your City Mentioned in This Issue of Municipal Journal?

If not, does this mean that it isn't a live city—or that you haven't sent us the story of what your city is doing now? Send us all news—of contracts, of proposed work, annual reports—long items—short items—anything of interest.

Every time your city's name appears it is getting valuable publicity and you are helping the cause of better city administration all over the country.

Index to Advertisements

A	Page
A. G. A. Railway Light & Signal Co.	—
Allis-Chalmers Mfg. Co.	34
Alvord & Burdick	35
American Appraisal Co., The	35
American-La France Fire Eng. Co.	37
American Tel. & Tel. Co.	—
Atlas Portland Cement Co.	36
Austin-Western Road Mach'y Co.	—
Automatic Signal & Sign Co., The.	5
B	
Badger Crushed Granite Co.	4
Barrett Co., The	—
Bissell Company, F.	—
Bitoslag Paving Co.	—
Black & Veatch	35
Broesman, Chas.	35
Burns & McDonnell	35
C	
Caird, James M.	35
Cast Iron Pipe Pub. Bureau, The.	8
Central Foundry Co., The	—
Champion Potato M'chy Co.	37
Coldwell-Wilcox Co	34
Collins, J. L.	35
Cook, A. D.	39
Couple Gear Freight-Wheel Co.	—
Cummer, F. D., & Son Co.	2
D	
Dayton-Dick Co.	—
Dee, Wm. E., Co.	—
Direct Oxidation Process Corp.	8
Dow & Smith	35
Duplex Truck Co.	—
E	
East Iron & Mach. Co., The	6
East Jersey Pipe Corporation	—
East Ohio Sewer Pipe Co.	36
Electric Ozone Sterilizer Co.	—
Electro Bleaching Gas Co.	8
Elgin Sales Company	2
F	
Fabric Fire Hose Mfg. Co.	38
Flower-Stephens Mfg. Co.	8
Ford Meter Box Co.	34
G	
Gamewell Fire Alarm Tel.	6
Glauber Brass Mfg. Co.	—
H	
Hazen, Whipple & Fuller	35
Heller & Brightly	36
Hetherington & Besner	4
Hering, Rudolph	35
Hersey Mfg. Co.	39
Holzbog & Bro., Geo. H.	2
Hornblower & Weeks	29
Hotel Cumberland	5
Hotel Martinique	—
Howard, J. W.	35
I	
Indian Refining Co.	4
International Motor Co.	—

K	Page
Knowles, Morris	35
Koehring Machine Co.	6
Koppel Industrial Car & Equipment Co.	—
L	
Layne & Bowler Co.	34
Lehigh Portland Cement Co.	6
Lehman, J. H.	5
Littleford Bros.	2
Loper Fire Alarm Co.	—
Luitwieler Pumping Engine Co.	39
M	
Machinery Warehouse & Sales Co.	33
Marten, Orth & Hastings Corp.	—
Morse, W. F.	34
N	
Nat'l Water Main Cleaning Co.	37
New York Continental Jewell Filtration Co., The	34
Northwestern Steel & Iron Wks.	37
O	
Odorless Sewer Basin Co.	37
Okonite Co., The	7
Otterson Auto-Eductor Co., The	—
Owensboro Ditcher & Grader Co.	31
P	
Pacific Flush-Tank Co.	37
Parker, A. A.	—
Penn. Salt Co.	—
Permutit Co.	—
Pitometer Co., The	38
Pittsburgh Filter Mfg. Co.	39
Pittsburgh Meter Co.	39
Pollock & Taber	35
Potter, Alexander	35
R	
Ransome Concrete Machy Co.	6
Republic Creosoting Co.	—
Roberts Filter Mfg. Co.	39
S	
Sanitation Corporation, The	38
Smith, A. P. Mfg. Co., The	34
Stacy-Bates Co.	39
Standard Oil Co. (Ind.)	—
Standard Oil Co. (N. Y.)	4
Standard Paint Co., The	—
Stewart, W. H.	38
Stuebner, G. L.	36
Sullivan Machinery Co.	—
T	
Taylor, Henry W.	35
Terre Haute Vitrified Brick Co.	6
Thomson Meter Co.	—
Thornton Fire Brick Co.	6
U	
Union Water Meter Co.	37
U. S. Asphalt Refining Co.	4
U. S. Tire Co.	7
V	
Vitrified Pipe Mfg. Association	—
W	
Wallace & Tiernan Co.	8
Ward, Chas. R., Engineering Corp.	35
Warren Bros. Co.	—
Warren Foundry & Machine Co.	39
Wickes Bros.	38
Willite Road Construction Co., Inc.	—
Wyckoff Pipe & Creosoting Co.	6
Z	
Zeig, F. B., Mfg. Co., The	—
Zelnicker, Walter A., Supply Co.	33

If You Have a DEEP WELL ending in WATER-BEARING SAND OR GRAVEL

equip it with the **COOK PATENT BRASS TUBE WELL STRAINER** and secure the maximum capacity of the well free from sand or particles of any kind. These strainers are in use by the Department of Water Supply of New York City, Parkersburg, W. Va., Memphis, Tenn., and Dayton, Ohio.

Upon the completion of the well, allow me to quote upon a **Steam, Belt or Motor Driven Deep Well Pumping Outfit.**

WRITE FOR NEW CATALOGUE

A.D.COOK Manufacturer, Lawrenceburg, Ind., U.S

APPROVAL

HERSEY DETECTOR METER

The Hersey Detector Meter has been accepted for thirteen years in 3", 4", 6", 8", 10" and 12" sizes without any restrictions or conditions of any kind by every Insurance Company, Stock and Mutual, doing business in the United States, and by the Water Departments and Water Companies in more than 600 Cities and Towns for use on over 4,000 Fire Services protecting over $2,000,000,000. worth of Insured Property.

HERSEY MANUFACTURING COMPANY

BOSTON NEW YORK CHICAGO COLUMBUS, O

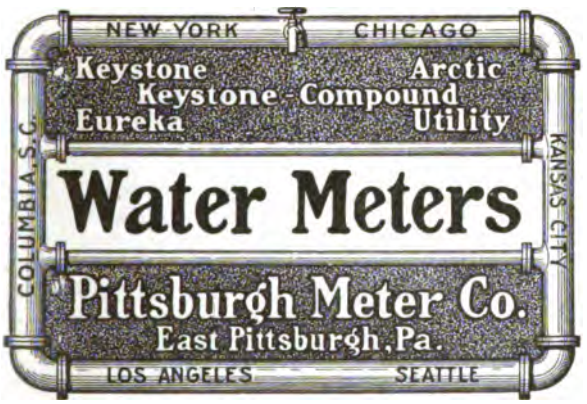
PHILADELPHIA ATLANTA SAN FRANCISCO

Roberts Filter Mfg. Co.

Darby, Penna.

WATER FILTERS for Municipal and Industrial Plants. Gravity and Pressure Types.

CHEMICAL DEVICES



Saves Coal

Cuts Costs

The point of the Luitwieler story of pumping economy is the cam principle. Gives steady power. No jar or backlash. Saves fuel and labor. Takes wheeze and strain out of pumping—cuts repairs and depreciation. Hundreds of city and private water plants have tried the principle and swear by it.

"We speak with authority."

Why and proof in Catalogue 14.

LUITWIELER PUMPING ENGINE CO.
ROCHESTER N.Y.

700,000,000 MILLION
Gallons of PURE WATER furnished by PITTSBURGH FILTER PLANTS

Nearly 175 Cities Supplied
Gauges, Controllers, Operating Tables, Hypo, Plants, Everything for Pure Water

PITTSBURGH FILTER MFG. CO.
KANSAS CITY, MO. PITTSBURGH, PA.

Manufacturers of

CAST IRON PIPE

BELL AND SPIGOT

FOR WATER—GAS—CULVERTS—SEWERS

Also Flexible Joint Pipe—Cylinders—Tubes, Milled and Plain Ends—High Pressure Fire Service Pipe—Special Castings. Flanged Castings a Specialty.
Quality and Service Guaranteed

FLANGED-PIPE

Warren Foundry & Machine Company
Offices, 11 Broadway, N. Y. 201 Devonshire St., Boston, Mass.
Works, Phillipsburg, N. J.

DECARIE INCINERATORS
FOR MUNICIPALITIES AND INSTITUTIONS
—ECONOMICAL AND SANITARY—
STACY-BATES COMPANY
McKNIGHT BLDG. SELLING AGENTS WRITE FOR LITERATURE MINNEAPOLIS

The Municipal Index for 1917

An Index to Leading Articles on Municipal Subjects Published in 1917 on

Paving	***Police***
Sewerage	***Street Cleaning***
Sanitation	***Government***
Water Supply	***Finance***
Lighting	***City Planning***
Fire	***Structures***

A municipal reference library in itself.

FEW cities can maintain a municipal reference library with such splendid facilities as that of New York City. Few city officials, municipal engineers and consulting engineers could spare time to avail themselves of its opportunities.

A knowledge of modern progress obtainable only through the current periodicals is absolutely indispensable to efficient handling of municipal affairs, whether in an administrative or a consulting capacity. The latest and best thought of the best men in the field is always at your command through the new 1917 Municipal Index in convenient, classified and completely indexed form for full and easy reference.

Price, $1.00

1916 and 1917 for $1.50

MUNICIPAL JOURNAL, 243 W. 39th Street, New York

Municipal Journal

Volume XLVI NEW YORK, JANUARY 11, 1919 No. 2

AMERICAN METHODS AND MACHINERY APPLICABLE TO CONSTRUCTION AND MAINTENANCE OF FRENCH HIGHWAYS

An Article the Object of Which Is to Assist Engineers in France in Restoring the Roads That Have Been Worn Out by War Traffic or Destroyed by the Enemy.

By ARTHUR H. BLANCHARD,*

The highways of France represent an asset that any commonwealth in the United States would be proud and thankful to possess after millions of dollars had been expended upon its system of highways. It is well, upon the dawn of an era of unprecedented highway improvement in the United States, to take sober counsel and consider the reasons why the financial investment in the highways of France has resulted in a dollar's worth of highways being secured for every dollar expended. Briefly summarized, the admirable record credited to French engineers may be attributed to the following influential factors:

1. No political influence in the selection of men placed in the control of highway work, and no interference by bodies of laymen with the legitimate work of the highway engineer.

2. Appointment of thoroughly educated and trained highway engineers of long experience to responsible administrative and engineering positions in the Nationale, Departement, Arrondissement and Canton highway departments.

3. A source of supply of thoroughly educated highway engineers through the medium of the Ecole Nationale de Ponts et Chaussees.

4. The desired esprit de corps in highway organizations due to promotions based on merit and continuation in office of highway engineers who have rendered faithful and efficient service.

5. Concentration of responsibility in the supervision of highway work; a military organization of interrelated responsibility being characteristic of the Departement National de Ponts et Chaussees.

A large percentage of the highways under consideration have waterbound broken stone roadways, many of which have been surface treated with tar. In the northeastern part of France hundreds of miles of broken stone

*M. Am. Soc. C. E., M. Société des Ingénieurs Civils de France. Consulting Highway Engineer, New York City.

FIG. 15—METHOD OF FINISHING CEMENT CONCRETE PAVEMENT.
"Floats" used from plank "bridge."

roadways have been worn out by excessive traffic or have been destroyed by the ravages of war. In other sections the transportation of troops and supplies have subjected the roadways to abnormal traffic, primarily due to the vast increase in the tonnage carried and the large number of motor trucks used by the armies and for general transportation purposes. It is evident, therefore, that the French engineers will have opportunity to economically employ new methods of construction in those cases where the roadways have been worn out or destroyed. Because of loss of man power and the necessity for rapid restoration of roads worn out by war service, there would seem to be greater need than ever in France for the use of labor-saving machinery, which class of machinery has, it is believed, been developed to a greater degree by American practice than by French.

In considering the reconstruction problems confronting the French engineers, it is essential that the fundamental economic principle of efficient use of local materials be given due consideration. France has at hand, or within reasonable transportation distances, sand, gravel, broken stone, cement, tar, rock asphalt, wood blocks and stone blocks. Of these materials, rock asphalt, wood blocks and stone blocks will be omitted from consideration, as their use in pavements has been efficiently developed by the French municipal engineers.

The types of roadway surfacings which will prove of widest adaptability to the French engineers, will be water-bound broken stone with a thin surface treatment of tar, bituminous concrete, cement-concrete, and stone block. All of these types may be constructed of the materials found in France or of those which are easily accessible. The economic utilization of the roadway surfacings mentioned will depend upon the suitability of the type for the probable traffic and other local conditions.

FIG. 1—KINNEY MOTOR TRUCK PRESSURE DISTRIBUTOR.

6. The design and construction of highways based on sound fundamental principles of proper location, alignment and grades, adequate widths of roadway and right-of-way, and efficient drainage and foundations.

7. Continuous maintenance by a thoroughly trained and efficient organization of patrolmen.

8. Economic and efficient methods of financing the construction and maintenance of highways.

The highway engineers of the United States have made notable progress in the development of many types of roads and pavements, not commonly used in France, while American manufacturers may be credited with having placed at the disposal of engineers efficient machinery which far surpasses in variety, wide range of adaptability, and standardization of parts, the output of any other

FIG. 2—PRESSURE DISTRIBUTOR IN SERVICE.

FIG. 3—FILLING MOTOR TRUCK PRESSURE DISTRIBUTOR FROM RAILWAY TANK CAR.

country. Because of these factors, a presentation of some conclusion, based on American practice, may be of value to French highway engineers.

In presenting suggestions relative to the adaptation of American methods and machinery to the reconstruction and maintenance of the highways of France, the writer approaches the subject with hesitation born of inbred respect and admiration for the work of the Department Nationale de Ponts de Chaussees, many members of which the writer has become acquainted with during several sojourns in France.

This discussion will be confined to the highways of France outside of urban districts.

WATER-BOUND BROKEN STONE ROADWAYS WITH THIN SURFACE TREATMENTS OF TAR.

French engineers have little to learn from American practice with reference to the construction of water-bound broken stone roadways. Two suggestions will be offered pertaining to tar surface treatments.

First: refined tar should always be employed and it should be purchased under specifications covering its essential properties for highway work. The adoption of

FIG. 4—BITUMINOUS CONCRETE MIXING PLANT. "CUMMER" PORTABLE PLANT.

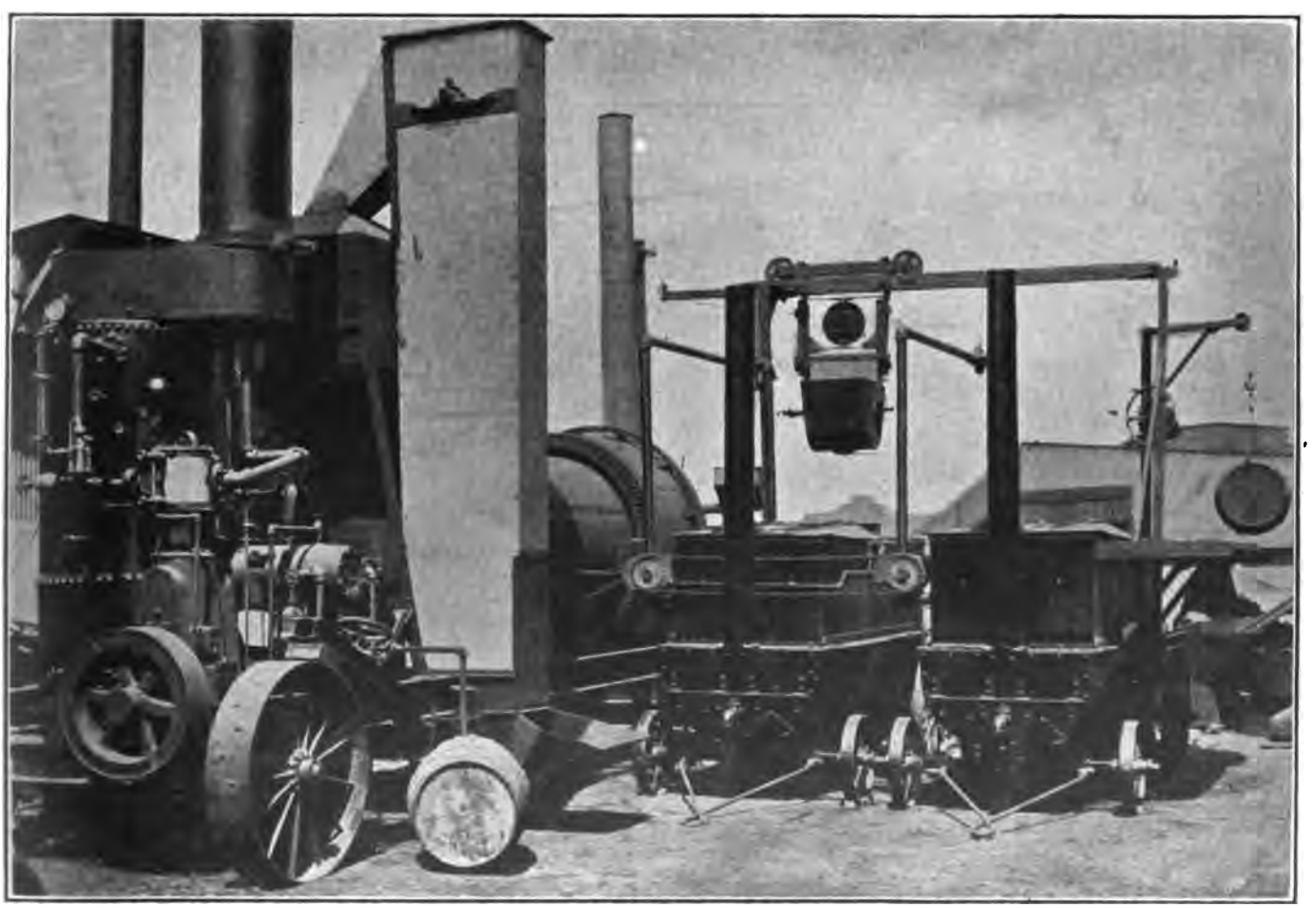


FIG. 5—WARREN BROTHERS' PORTABLE MIXING PLANT.

this recommendation will insure the use of a refined tar which is uniform in quality and of the most suitable grade for surface treatment work. It should also be noted that unheated refined tar of proper consistency is being successfully used in the United States, especially for the retreatment of tar surfaces.

FIG 6—RAILROAD MIXING PLANT. EAST IRON COMPANY'S "MERRIMAN" PLANT.

Second: motor truck pressure distributors of eight to twelve hundred gallons capacity (see Figs. 1, 2 and 3) should be employed for the distribution of the tar in many sections of France. Small gravity and pressure distributors will not be discussed, as French manufacturers have for many years supplied efficient machines of this class. The large mileage of broken stone roadways in France insures that the use of large-capacity distributors will be especially economical and efficient. There are several types of such machines in common use in the United States, the essential features of which are covered by the following specifications which have been adopted by the American Society for Municipal Improvements:

"The pressure distributor employed shall be so designed and operated as to distribute the refined tar specified uniformly under a pressure of not less than 20 pounds nor more than 75 pounds per square inch in the amount and between the limits of temperature specified. It shall be supplied with an accurate stationary thermometer in the tank containing the refined tar and with an accurate pressure gage so located as to be easily observed by the engineer while walking beside the distributor. It shall be so operated that, at the termination of each run, the refined tar will be at once shut off. It shall be so designed that the normal width of application shall be not less than 6 feet and so that it will be possible on either side of the machine to apply widths of not more than 2 feet. The distributor shall be provided with tires of widths dependent upon the following

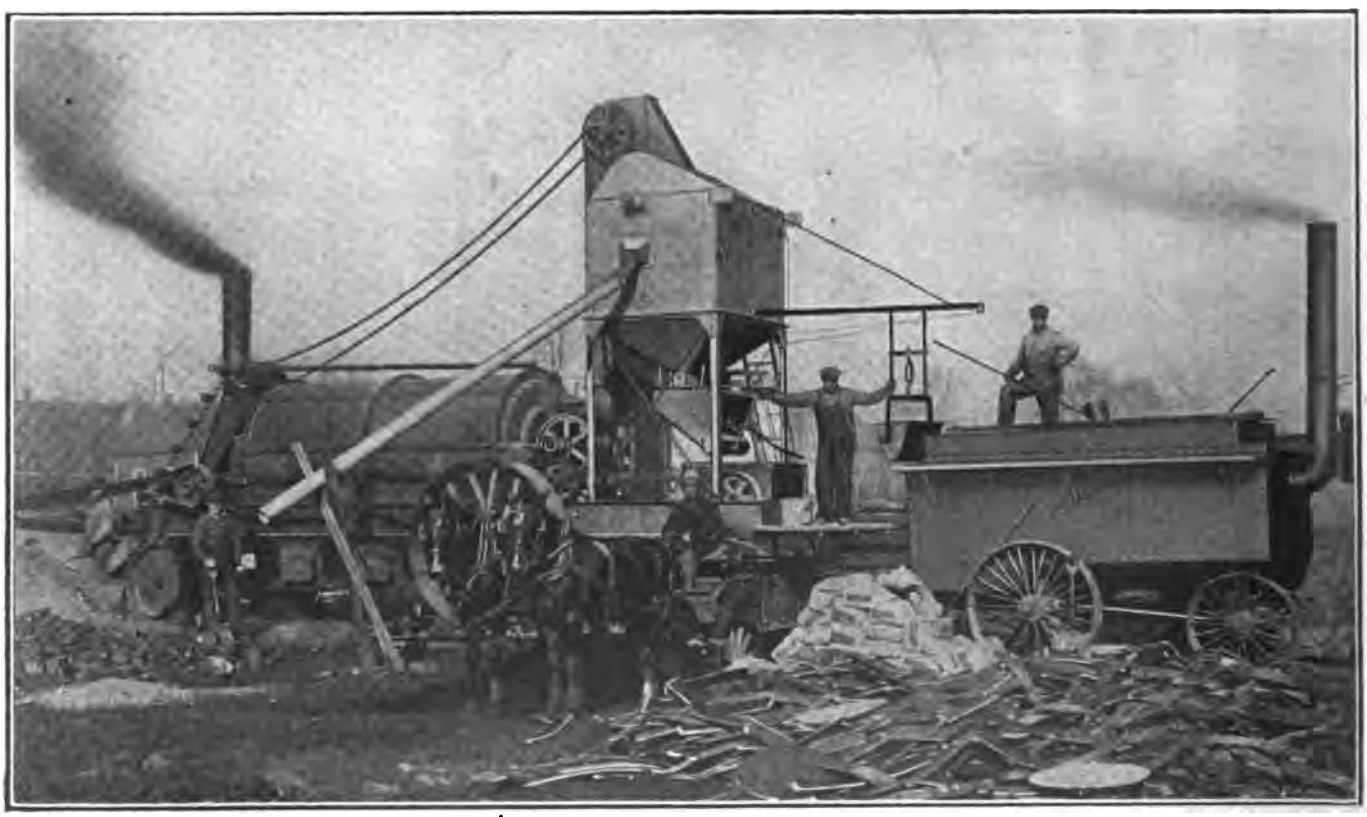


FIG. 7—MIXING BITUMINOUS CONCRETE WITH HETHERINGTON & BERNER PORTABLE ROAD PLANT NO. 5.

relationship between the pressure per square inch of tire and the diameter of the wheel; for a 2-foot diameter wheel, 500 pounds shall be the maximum pressure per linear inch of width per wheel, an additional pressure of 30 pounds per inch being allowed for each additional 3 inches in diameter."

Some American distributors efficiently utilize pressure from air compressors. Steam is delivered to the compressors either from a boiler mounted on a distributor or from steam roller or tractor. By the passage of

FIG. 8—SPREADING AND ROLLING CLASS A BITUMINOUS CONCRETE.

steam through a system of pipes, the bituminous material is heated to the desired temperature. The material is distributed through either one or two horizontal pipes equipped with nozzles. Several pressure machines equipped with mechanical power pumps have been invented in the United States. The distributing devices of all of these machines are alike in having horizontal pipes fitted with nozzles. The machines differ somewhat in the way the pressure is obtained and applied. Pumps, run by a sprocket-drive attachment on the rear axle, by steam, and by gasoline, are utilized. Horses and steam rollers are used for hauling some distributors, while others are mounted on motor truck chasses.

The following factors should be given consideration when selecting a pressure distributor: (1) Character and range of work upon which the distributor will be used; (2) present and probable requirements in specifications pertaining to type and details of distributors and the work to be done; (3) different types and grades of bituminous materials which the machine will distribute, and the range in the amount per square yard which can be applied; (4) the range in pressure per square inch; (5) method of controlling uniformity and amount of distribution; (6) accessories of distributors for heating material, recording temperature of bituminous material, amount in tank, amount of pressure, and shutting off bituminous material at end of run; (7) width of distribution and means for modifying same; (8) motive power; (9) width of tires and loads per linear inch of tires when tank is full; (10) ease of operation and repair; (11) structural strength; (12) amount and character of labor required to efficiently operate the distributor; (13) economics, including overhead, operation and maintenance charges.

FIG. 10—APPLICATION OF SEAL COAT BY HAND-DRAWN DISTRIBUTOR ON CLASS A BITUMINOUS CONCRETE.

BITUMINOUS CONCRETE PAVEMENTS.

As defined by the Special Committee on "Materials for Road Construction" of the American Society of Civil

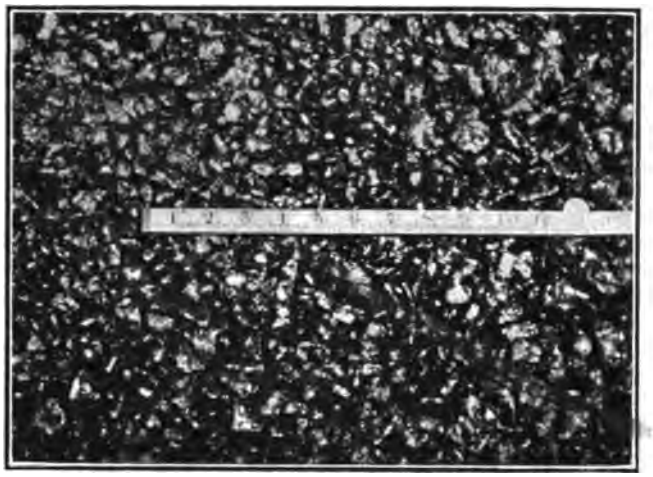


FIG. 9—SURFACE OF BITUMINOUS CONCRETE, CLASS A, BEFORE APPLICATION OF SEAL COAT.

Engineer, "a bituminous concrete is one composed of broken stone, broken slag, gravel or shell, with or without sand, Portland cement, fine inert material or combinations thereof, and a bituminous cement, incorporated together by a mixing method."

Bituminous concrete pavements may generally be grouped into three classes, having the following characteristics:

Class A. A bituminous concrete pavement having a mineral aggregate composed of one product of a crushing or screening plant.

Class B. A bituminous concrete pavement having a mineral aggregate composed of a certain number of parts by weight or volume of one product of a crushing or screening plant, and a certain number of parts by weight or volume of sand, broken stone screenings or similar material, with or without a filler.

Class C. A bituminous concrete pavement having a predetermined mechanically graded aggregate composed of broken stone, broken slag, gravel or shell, with or without sand, Portland cement, fine inert material or combinations thereof.

This discussion will be confined to pavements of

FIG. 11—CONSTRUCTION OF TOPEKA BITUMINOUS CONCRETE PAVEMENT.

Classes A and C. The status of bituminous concrete pavements of Class B is covered by the following conclusion presented by the Committee of the American Society of Civil Engineers mentioned above:

"Specifications for pavements of this class have generally stipulated that so many parts of broken stone or gravel and so many parts of sand or other fine material are to be mixed with a certain quantity of bituminous cement. By the use of this specification, and with unusual supervision, it is practicable to secure a fairly well-graded aggregate; but in most cases the mixture will be found to contain an excess of broken stone, with insufficient fine material to fill the voids therein, and in other cases it will contain an excess of sand in which the broken stone is held as isolated particles."

Foundations. The foundation should be strong enough to carry the traffic to which the pavement is to be subjected. Many failures have occurred due to laying bituminous concrete pavements on weak foundations. Satisfactory results have been obtained under medium traffic with thoroughly filled and compacted broken stone, and bituminous concrete foundations. Cement-concrete foundations have been used successfully under the heaviest traffic for which the several classes of bituminous concrete are suitable, especially in cases where the road-beds have been well drained.

Bituminous Materials. The bituminous cements which have been used successfully in the construction of bituminous concrete pavements of Class A include asphalt, water-gas tar and coal-tar cements, and cements which are combinations of refined tars, and combinations of refined tars and asphalts. Experience has demonstrated that the most efficacious bituminous concrete pavements of this class are constructed by using suitable asphalt cements or refined tars in the mix, and asphalt cements for seal coats. Satisfactory results will be secured when tar cements are used for seal coats, but the surface must be re-treated more frequently than when asphalt cements are used. For Class C pavements, asphalt cements are used almost exclusively, tar cement having been employed to a limited extent.

The amount of bituminous cement used is generally expressed as the per cent, by weight, of bitumen in the bituminous concrete, not including the bituminous cement used as a seal coat. For Class A, the per cent of bitumen varies from 5 to 8 per cent, and for Class C, from 7 to 9 per cent. French engineers should note that the above use of the word bitumen is based upon the American definition which states that bitumen is that portion of an asphalt or tar cement which is soluble in carbon disulphide.

Class A. A large mileage of bituminous concrete pavements of this type have been constructed in the United States, the aggregate of which complies with the following specification adopted by the American Society for Municipal Improvements: "Broken stone for the mineral aggregate of the wearing course shall consist of one product of a stone crushing and screening plant. It shall conform to the following mechanical analysis, using laboratory screens having circular openings: All of the broken stone shall pass a 1¼-inch screen; not more than 10 per cent nor less than 1 per cent shall be retained upon a 1-inch screen; not more than 10 per cent nor less than 3 per cent shall pass a ¼-inch screen."

Plants of many types (see Figs. 4, 5, 6 and 7) have been successfully employed in the manufacture of Class A bituminous concretes. Naturally the most economical and efficient work has been accomplished by plants especially adapted for mixing Class A aggregates. Generally, on highway work outside of urban districts, the portable plant proves most satisfactory. Dependent upon the plant accessories, the aggregate is measured by

FIG. 12—MIXING GANG AND MATERIALS FOR CONSTRUCTION OF CEMENT CONCRETE PAVEMENT.

volume or weight before being dried or by weight after drying, the latter being preferable. The aggregate is usually dumped into bucket elevators, which discharge into rotary driers. In the best types of plants, the heated aggregate is then raised by bucket elevators and discharged into a small storage bin. As desired, the heated aggregate is drawn from the storage bin and allowed to fall directly into the pug mill mixer or, preferably, first into a weighing box. The bituminous cement is weighed in scales on the mixing platform and then dumped into the mixer. After thorough mixing, the bituminous concrete is usually discharged into a wagon or truck, which the plant arrangement permits to be placed directly beneath the mixer.

In cases where neither curbs, gutters nor edgings are used, thoroughly compacted shoulders are constructed. To serve as definite boundaries and to prevent the bituminous concrete from being forced out over the shoulders during rolling, 2-inch planks may be placed on the shoulders at the edges of the roadway and allowed to remain until after the seal coat is applied. After the bituminous concrete has been deposited on the foundation course, it should be uniformly spread by raking (see Fig. 8) to a depth such that when compacted the wearing course will have the desired thickness, which is usually 2 inches (see Fig. 9). After being uniformly distributed, the bituminous concrete is rolled while it is still warm and pliable. The rolling should begin at the edges and work towards the center. Rolling should continue without interruption until all roller marks disappear and the surface shows no further compressibility. Any places which the roller cannot effectively compress should be compacted with hot iron tampers. Excellent results can be secured by the use of tandem rollers, weighing between 8 and 12 tons and having a compression under the rear roller of from 250 to 350 pounds per linear inch of roll. Equally good results have been obtained by using a 5 to 8-ton tandem roller to shape up the wearing course, and a 12-ton three-wheeled roller for the thorough compaction of the bituminous concrete. In order to prevent ashes from dropping onto the bituminous concrete, each roller should be provided with an ash pan.

After the wearing course has been rolled sufficiently so that the wheels of the roller do not make any creases, a coat of bituminous cement is applied to the surface. The surface should be clean and absolutely dry when the seal coat is applied. In many cases the bituminous concrete will have to be thoroughly swept before the application of the seal coat. From ½ to 1 gallon per square yard of bituminous cement should be used, the requisite amount varying directly with the openness of the compacted bituminous concrete surface and the kind of bituminous cement used. The best method of constructing a uniformly distributed seal coat is to use a hand-drawn gravity distributor followed by a man pushing a rubber or leather squeegee (see Fig. 10). The squeegee should have a width greater by from 4 to 6 inches than the width of the sheet of bituminous cement as it falls from the distributor. By being kept from 2 to 4 inches back of the sheet of bituminous cement, a very even distribution may be easily obtained. As soon after the application of the bituminous cement as possible, a thin layer of dry, clean chips should be uniformly spread over the coat of bituminous cement, the total amount of chips being preferably distributed in two applications. The chips should be rolled at least twice in order to force them into the interstices of the surface and secure the maximum bond with the bituminous cement.

Class C. The two types of bituminous concrete pavements of this class which have been used most extensively in the United States are known as Topeka (see Fig. 11) and Bitulithic pavements.

The characteristics of the Topeka pavement are covered by the following specification for its aggregate as adopted by the American Society for Municipal Improvements:

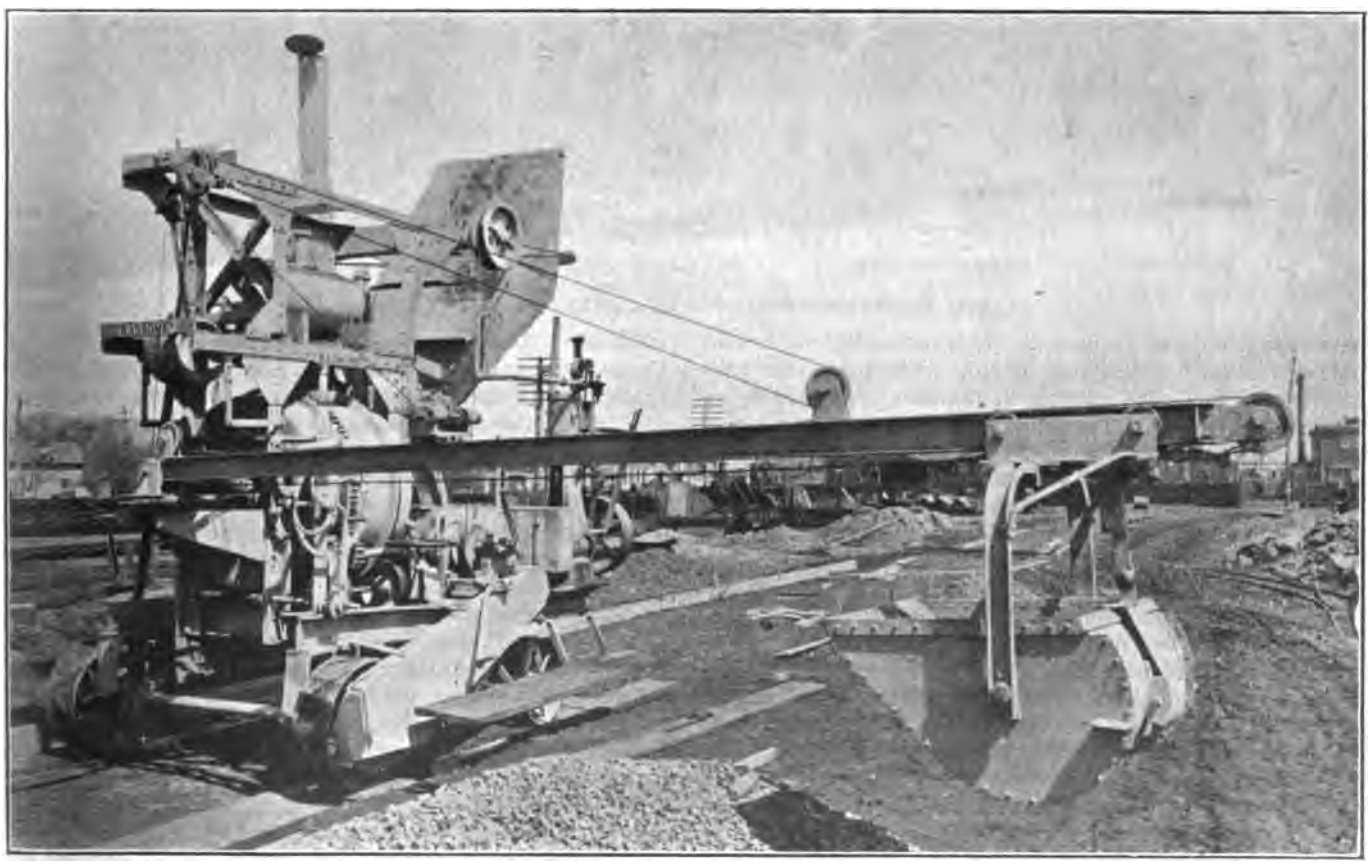


FIG. 13—RANSOME MIXER: BATCH TYPE WITH BOOM AND BUCKET.
Capacity—10 cu. ft. of wet mixed concrete, or 14 cu. ft. of loose aggregates.

"The proportions of the various ingredients composing the bituminous concrete shall be as follows:

Bitumen	7 to 9%
Passing 200-mesh sieve	7 to 10%
Passing 80-mesh sieve, but retained on a 200	10 to 20%
Passing 40-mesh sieve, but retained on an 80	10 to 25%
Passing 20-mesh sieve, but retained on a 40	10 to 25%
Passing 8-mesh sieve, but retained on a 20	10 to 20%
Passing 4-mesh sieve, but retained on an 8	15 to 20%
Passing 2-mesh sieve, but retained on a 4	5 to 10%

The Bitulithic pavement is patented in the United States. The method of its manufacture is as follows, as described by a representative of the patentees: "The operation of a semi-portable Bitulithic plant is as follows: The raw materials, namely, crushed stone, screenings, and sand, are fed from the storage piles at the rear of the plant into the cold-stone elevators, are heated in the driers, then elevated to the rotary screen, which is enclosed in a screen house. This screen consists of the several sections which are required to separate the mineral aggregate into the various sizes. The hot stone passing each of these screen sections drops into its compartment in a sectional bin and is thus kept separate from other sizes. The boxman weighs out the amount of each size required into a weigh-box supported on platform scales with a multiple beam which enables him to weigh each size separately and accurately. It is impossible to formulate a standard screen test or rule as to just what proportion of each size particle of mineral aggregate is required to produce the maximum density or minimum of voids, because the stone from different quarries crush into different shapes. The proportions are scientifically determined for each case by laboratory tests. By following the best practice as described, the resulting combination of varying sizes of mineral aggregate will contain approximately 12 per cent of voids to be filled with bituminous cement. While the weighing is taking place, the mixer-man has filled the bituminous cement bucket with the required weight of Bitulithic cement by dipping from the melting tanks, the weight of bituminous cement being accurately measured by scales on the bucket carrier. The bituminous cement and mineral aggregate are then emptied into the mixer and thoroughly mixed until all particles are completely coated and the mass has been transformed into a uniform bituminous concrete, when the slide under the mixer is opened and the batch dropped into the wagon waiting under the platform."

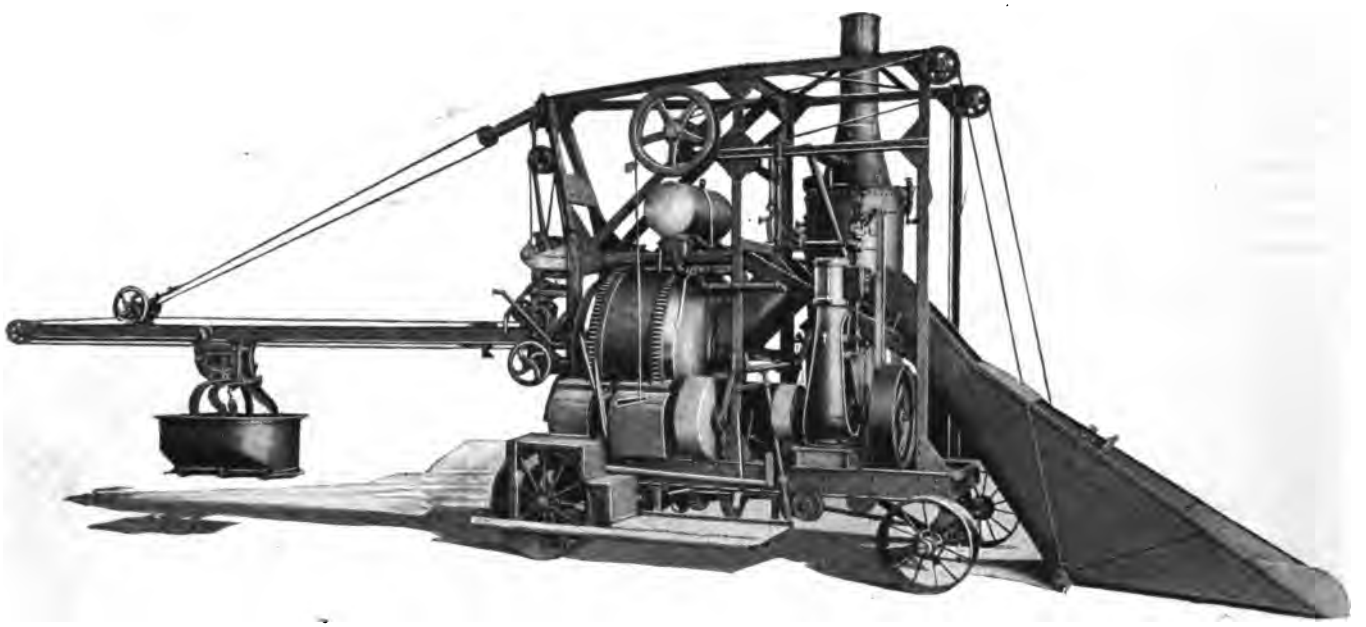


FIG. 14—KOEHRING CONCRETE MIXER, BATCH TYPE.

The methods of laying, rolling and finishing bituminous concrete pavements of Class C are similar to the methods previously described with reference to Class A pavements, except that many Topeka pavements are not finished with a seal coat of bituminous cement.

CEMENT-CONCRETE PAVEMENTS.

In the United States, the first cement-concrete pavement, that is one having a wearing course of hydraulic cement concrete, was laid in the State of Ohio in 1894. It was not until 1900, however, that this material was used to any extent as a wearing course. The utilization of cement-concrete as foundations is of long standing in the United States. Its record as an efficient foundation, especially when laid on a well-drained roadbed, is well known to French engineers. The cement-concrete pavement is as yet in its infancy as compared with roadways of broken stone, stone block and some others. In considering its use on the highways of France, therefore, its dual capacity should be kept in mind. On roadways destroyed or badly worn it may be an economical proposition to use cement-concrete pavements constructed at such elevations that after their period of life as pavements has expired they may serve efficiently as foundations for new wearing courses.

Subgrade and Foundation. Cement-concrete pavements should be laid only on a well-compacted and well-drained subgrade. The surface should usually be made flat and should be thoroughly rolled with a medium-weight roller. Prior to the deposition of the concrete the subgrade should be thoroughly wet, otherwise the subgrade will absorb water from the concrete, thus preventing a uniform set and decreasing its strength.

Ingredients and Proportioning. The materials used for the fine aggregate of a cement-concrete pavement are generally sand or stone screenings, and for the coarse aggregate either broken stone or gravel. The broken stone employed should be obtained by crushing hard, tough rock. Preferably the stone should be composed of naturally graded sizes and free from dust or dirt. What has been said relative to broken stone applies as well to gravel, since a screened gravel with the fine material eliminated allows a more accurate determination of the correct proportions. The sand used should be clean, sharp, and coarse, free from loam, clay, and vegetable or organic matter. The cement should be a first-class Portland cement that will meet the standard specifications of the American Society for Testing Materials. Care should

be taken to use clean water, since water which contains any alkalies or acids will be detrimental to the concrete. The proportions which are used in connection with the construction of concrete foundations are not rich enough in either cement or mortar to make satisfactory concrete which is to be subjected to the abrasive and impact forces of traffic. The proportions used for the best class of cement-concrete pavements are about one cement, one and one-half or two fine aggregate, and three coarse aggregate.

The following excerpts from conclusions reported in 1918 by the above mentioned committee of the American Society of Civil Engineers are worthy of note: "Fine aggregate may be sand or screenings from hard, durable rock that will pass a screen having ¼-inch circular openings. The best fine aggregate is in general that which is graded fairly uniformly from the ¼-inch size mentioned above, downward, but not more than five per cent should be of such fineness that it will pass a sieve having 100 meshes per linear inch. Coarse aggregate in general should not be larger than will pass a screen with 2-inch circular openings, ranging down fairly uniformly from this size to that retained on a ¼-inch screen. A denser and more uniform concrete may be made by screening the material, both fine and coarse aggregates, into different sizes and re-combining these different sizes in such a way as will give the densest mixture, that is, the smallest percentage of voids, when dry (than by following the arbitrary rule of a 1:2:3 mix, for example). The slight increase in time and expense which is incurred by determining the voids and combining the various sizes to get the greatest density is more than repaid by the strength and density of the resulting mixture. Similar care in the determination of the proper quantity of water is also to be desired in order that the concrete may have a uniform consistency as it is deposited in place. Though the mixture should be rather wet, especially if it is deposited without tamping, it should still be stiff enough to hold its shape when struck off by the template, and yet not result in segregation of the different sizes throughout the mass."

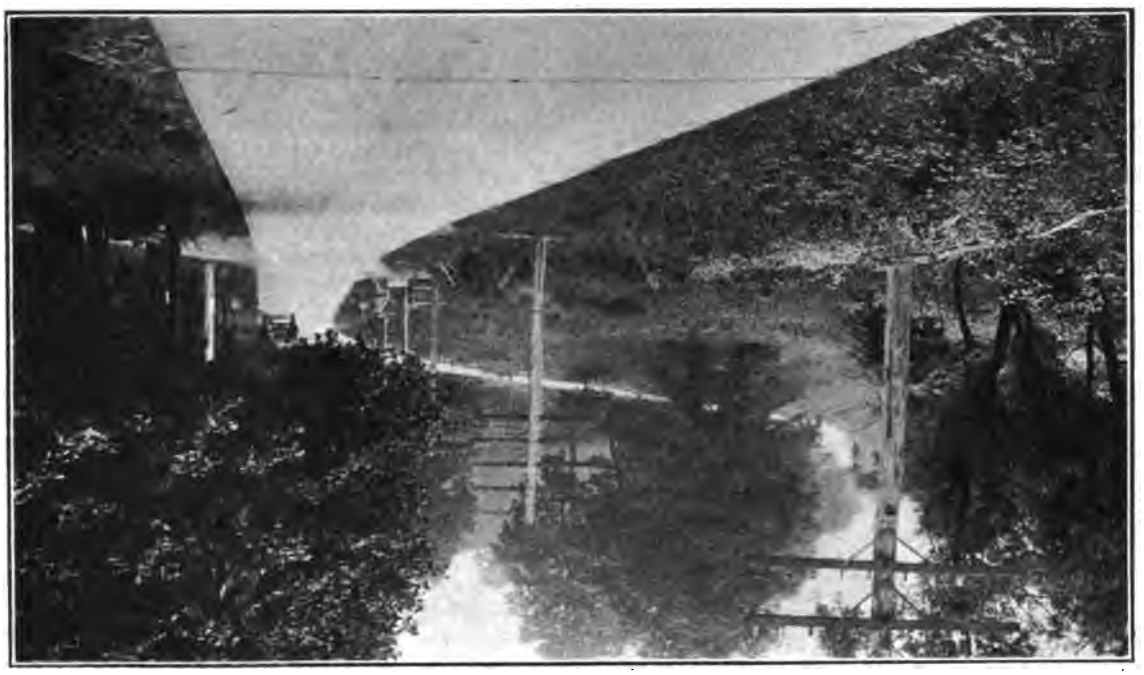


FIG. 16—FINISHED CEMENT CONCRETE PAVE MENT, SHOWING TRANSVERSE EXPANSION-CONTRACTION JOINTS.

Construction. The essential features of a plant operation are covered by the following excerpts from a report of a committee of the National Conference on Concrete Road Building: "The concrete mixer should be of the batch type provided with an automatic water tank, traction drive and power loader. Mixers having a boom and bottom-dump bucket (see Figs. 13 and 14) of sufficient size to convey one complete batch for placing the mixed concrete are preferred. Where necessary to keep from cutting into the subgrade and to facilitate moving, the wheels of the mixer should be run on suitable planking. The mixer should be provided with a suitable automatic water tank which can be quickly filled and emptied, so that when once determined, the required amount of water can be added to each batch of concrete. The power loader or skip should be of sufficient size to hold all the materials required for the batch. In charging the skip a part or all of the coarse aggregate should be placed first, and the cement, fine aggregate, and remaining coarse aggregate, if any, on top of this. All the cement should be in the skip before the last of the aggregate is added. The filling of the skip is accomplished in practice in two ways; by the use of wheelbarrows (see Fig. 12) and by shoveling direct from the supply piles into the skip. This latter practice, however, should be discouraged, for accuracy is impossible, and it encourages carelessness. Besides, the entire loading gang loses time waiting, while the skip is raised and lowered. It is recommended that all the materials in any one batch, including the water, should remain in the drum of the mixer at least 45 seconds before any of the concrete is discharged."

In plain cement-concrete pavements constructed by the mixing method, generally the concrete is deposited in one layer. Usually the average transverse slope does not exceed ¼ inch per foot. The thickness varies from 5 to 10 inches, dependent on traffic requirements and other local conditions. More attention should be paid to obtaining a smooth and regular surface in constructing cement-concrete pavements than is usually accorded concrete foundations. The use of templates to strike the surface of the concrete, and of bridges (see Fig. 15), which span

the concrete surface, thus enabling the laborers to work over the surface without standing on it, should be insisted upon. The surface may be finished by the use of wood floats (see Fig. 15), belts or light hand rollers. It is also important to protect the surface from too rapid drying out while the concrete is curing, otherwise shrinkage cracks are liable to occur. This is accomplished sometimes by covering the pavement as soon as it has taken its initial set with a canvas which is kept moist for a few hours. The canvas is then removed and the surface is covered with a layer of sand or earth, which is kept thoroughly moist for a period of two weeks.

Expansion Joints. Transverse joints (see Fig. 16) always should be provided. There will be more or less contraction and expansion of the concrete due to changes of temperature, variation in the moisture content of concrete, and variation in the condition and character of the subgrade. If expansion joints are not present, when the concrete contracts, the tensile strength of the concrete will be exceeded and the pavement will crack; when it expands it will tend to crush, spall, or bulge. The edges of the joints must be protected from the abrasive action of the traffic, and it is obvious that the joints should be filled with a material that will allow some movement between the joints as the pavement expands and contracts. The width of the transverse joints depends upon the distance between them. It is considered better practice to construct narrow joints at short intervals apart rather than wide ones far apart. Transverse joints are placed from 15 to 50 feet apart, 30 feet being an average distance.

If curbs are used, longitudinal joints should be constructed adjacent thereto. The width of the longitudinal joints will depend somewhat upon the width of the pavement. They are usually made from ½ to 1½ inches wide and are filled with a bituminous filler or a patented expansion joint is employed.

Reinforced Pavements. Reinforced cement-concrete pavements are usually constructed by the two-course method. The reinforcement usually consists of woven wire or expanded metal, although a mesh work of small round bars is sometimes used, and generally is placed between the base and the wearing course. At the last National Conference on Concrete Road Building, held in 1916, a committee reported that "it is only recently that reinforcement has been used to any great extent, and the interval is too short for the accumulation of the data necessary to standardize practice."

Miscellaneous Machinery. The limitations of this article do not permit a detailed discussion of the practicability of using, in connection with the reconstruction of French highways, many types of road machinery which have been found efficient in the United States. Graders, ditching machinery, portable steam shovels, special types of motor trucks and trailers, industrial railways, and loading devices may be mentioned as American machines which would well repay investigation if it was deemed advisable to send a commission of French highway engineers to the United States to study American methods and machinery used in highway improvement.

BILLINGS WATER WORKS NOTES.

The Billings, Montana, Water Department had 210 fire hydrants on its distribution system at the time of the 1918 report of the superintendent, J. F. Willett, and the city council had authorized the purchase of 40 sprinkling cart cranes; "which," says Mr. Willett, "is a wise thing to do, as fire hydrants are set for fire purposes only and should not be used as filling stations."

Heretofore, during the summer months the hydrants have been used by the street department for flushing streets and sewers and by the street sprinklers, and the superintendent in several previous reports has recommended this action. We agree with him that it is a wise move for the city; and it is unfortunate, in our opinion, that more cities do not set more of these appliances for preventing improper use and possible damage of fire hydrants.

Another action announced in this report is a decision of the Board of Water Commissioners to meter all services. On July 1, 1918, there were 723 meters in use, but a year later the number had been increased to 2,427, or about 75 per cent of the total number of services.

Superintendent Willett recommends using existing earth settling basins during such times as the river is most turbid, to secure sedimentation of the suspended matter before the coagulants are applied. He estimates that this would permit saving $2,000 a year in coagulants. The cost of putting the reservoirs into service would be between $4,000 and $5,000.

SURVEY OF BALTIMORE'S BOUNDARY.

The Legislature of Maryland on March 29, 1918, passed an act providing for annexing additional areas to the city of Baltimore, and this act gave power and authority to the surveyors of the Topographical Survey Commission, in performing the necessary work of laying out the new boundaries, to enter upon private properties at all times for the purpose of making surveys, and gave the city the right to erect and maintain suitable stones or posts marking the new boundaries.

The commission shortly after began making the preliminary surveys for establishing the new boundary lines, and these surveys have now been completed, and the line is marked by stakes where it crosses roadsides and at other points. As the survey was not completed until winter was practically at hand, no effort is being made to place any concrete or stone monuments along the boundary, but the commission expects to do this next spring.

The preliminary work began about June 1 and consisted of the extension into the newly added territory of the triangulation system which was established some years ago when a precise survey was made of the city. Twenty-seven new triangulation stations were established, but it was necessary to erect only one tower, the other stations being established on existing buildings and points on the ground. The tower that was erected was about eighty feet high and was constructed of timber.

Traverse lines were run between the triangulation stations, and during the present year it is expected to tie in these lines with the old traverse lines of the previous survey. In running these traverse lines the field work was performed with the greatest care, each angle being read six times, and the lines were measured with carefully tested steel tapes, the temperature of which was noted during the surveys and corrections made for expansion and contraction. The field force was composed of one triangulation party and four traverse parties, and an office force of computers brought the total number of men up to twenty-five.

As soon as all monuments have been permanently set, three plats will be prepared and duly certified by the chief engineer of the Topographical Survey, Major Joseph W. Shirley, the surveyor of Baltimore county, and the surveyor of Anne Arundel county. These plats will be recorded, one in the office of the clerk of the Circuit Court of each of these counties, and the third in the office of the clerk of the Superior Court of Baltimore.

Municipal Journal

Published weekly at
243 West 39th Street
by
Municipal Journal and Engineer, Inc.

S. W. HUME, President
J. T. MORRIS, Treas. and Mgr. A. PRESCOTT FOLWELL, Sec'y

A. PRESCOTT FOLWELL, Editor
SIMON BARR, Assistant Editor
CHARLES CARROLL BROWN, Western Editorial Representative

Telephone, 9561 Bryant, New York
Western Office, Monadnock Block, Chicago

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

THE STREETS OF WASHINGTON, D. C.

Up to two years ago, Washington was the capital of the country, in that it was the seat of the Federal Government, but in no other way. It was not a center of business, and what few organizations of a civic or commercial nature had established their headquarters there did so because the secretary was a Federal official rather than from any policy. When we entered the war, however, all other business became secondary to that of providing munitions, hundreds of heads of "big business" located there, and all lines of business and industry, of professional, industrial and labor organizations, and of most other branches of human activities, had representatives there. Washington took on many of the characteristics of a "boom" town.

Will the capital relapse to its former condition? There are many indications that it will not, but that national organizations, professional, social and industrial, as well as patriotic, will adopt that city as their headquarters, and that the large affairs of the country will be conducted there. If this be so, will the city continue to display the outward aspect of a country village? Will its pavements and sidewalks show long-neglected need of repairs? (For years the streets and walks around the capitol itself were in a disgraceful state of unrepair.) Will its street cleaning be performed intermittently and carelessly? Will disreputable shacks and unsightly slums continue to thrust themselves within a block or two of the congressional and departmental buildings?

Not one or two but scores of city engineers and other municipal officials have stated to the writer during the past ten years that these conditions in Washington seemed to them a disgrace to the country. To this city more than to any other (unless perhaps New York) come visitors from all over the Union. The opportunity is therefore unique for furnishing to the entire country an object lesson of what a city should be, but there is no indication that any effort is being made to this end. Elaborate plans have been prepared for the expenditure of millions in the construction of an architectural picture—a Federal center which might inspire the creation of civic centers throughout the country. But there is no inspiration to civic cleanliness, neatness, and orderliness. No visitor is given ocular demonstration of the possibilty of making residence and even business streets places in which it is a pleasure to walk; no public works official finds here details of street construction, street appurtenances, and street administration that impress him as worthy of adoption by his own city.

Washington is the city of the United States. It can draw upon untold billions of dollars for its administration. We are proud of the capitol, of the Congressional library and other Federal buildings; but as a city we are ashamed of it. It is to be hoped that, should it become a center of business, as well as of legislation, it will no longer be permitted to suggest a combination of silk hat and diamond scarf pin with muddy, down-at-the-heel shoes and shapeless, frayed trousers.

MUNICIPAL BONDS.

The most interesting facts about municipal bond sales during 1918 are the amount marketed and the prices at which they were sold. According to "The Bond Buyer," states and municipalities issued $260,661,464, which is about sixty per cent. of the amount issued in 1917 and fifty-three per cent of the 1916 total. When it is considered that during practically the entire year the Capital Issues Committee was exercising strict control over the issuing of bonds, and that the scarcity and high cost of labor and materials discouraged any but the most necessary construction, this total is larger than might have been expected.

Of more present interest as an indication of what may be expected this year are the prices obtained. In spite of the fact that billions of dollars worth of Liberty Bonds were sold and for a considerable part of the time monopolized attention, the change in price during the year was favorable to "municipals." The net income basis on which bonds of a number of large cities were sold dropped from an average of 4.66 per cent during the first four months to an average of 4.52 per cent during the last four, the first few days of 1919 showing sales on a 4.44 per cent basis. The average for the four years previous to 1918 was 4.16 per cent. Considering that the bill now in conference committee of Congress triples the income tax rate, and that interest on municipals is exempt from such tax, there seems to be every reason for supposing that the price at which cities can market bonds this year will be even more favorable than last year—as advantageous, in fact, as during 1913, 1914 or 1915 (4.16 per cent to 4.45 per cent).

EXPERT SUPERVISION OF WATER PURIFICATION.

Reference is made on another page of this issue to a typhoid epidemic which was suffered by Xenia, Ohio, because there was no one connected with the plant able to detect that the hypochlorite used was far below guaranteed strength. It would be interesting to learn how many water purification plants there are in the country where similar absence of expert supervision may at any time lead to an experience similar to Xenia's. That the number of such plants is very considerable seems unfortunately certain. In Ohio there are 48 water filtration plants and 12 disinfection plants, and of the former 16 have no expert technical supervision, while of the 12 disinfection plants, 4 are without such supervision. The Ohio State Board of Health is one of the most efficient in the country, and Ohio cities are among the most progressive, and it is therefore probable that in many other states the percentage of plants receiving expert supervision would be less than in Ohio. As the State Board

of Health says: "Operation of a purification plant by a man without technical training, however faithful and conscientious he may be, is always dangerous. A trained man can detect at once, by examination of the water, whether purification is being properly carried out. Where an untrained man is in charge, imperfect purification is more likely to be detected after the damage has been done."

THE FIRST ANNUAL REPORT.

A year ago we advised our readers that we had received prior to January 17 two annual reports for the year ending December 31, both typewritten but complete and of some length. The second to be received was that of T. Keith Legare, city engineer of Columbia, S. C. This year Mr. Legare has moved to first place, his report of eight pages exclusive of tables having been received on January 6. One paragraph of the report reads: "This report has been compiled at the earliest possible date in order that it may be of some service to the council in preparing their budget and plans for the coming year's work."

BOULDER'S BUDGET.

The first comparative budget of Boulder, Colo., prepared in compliance with the city's new charter by city manager E. O. Heinrich, has as its prominent characteristics completeness combined with conciseness and simplicity. Any citizen of average intelligence should be able to learn from it how it is proposed to spend next year's taxes, whether more or less is to be allotted to each class of services than during the two previous years, and why. The budget is prepared and made public three months before the end of the year, and a public hearing on it is given before its adoption by the council.

First is given the revenues from all sources during 1917 and 1918 and those estimated for 1919, itemized by sources. Next, the program for the municipal water plant for the year 1919. Then, departmental allotments, giving totals for each department and division. Following this, a more complete itemizing of each allotment, a table for each department. A statement is given of the interest-bearing liabilities of the city; the per capita expenses during 1917 and 1918 and required for 1919; and finally the sinking fund requirements. Together with three pages of comment and explanation, the whole occupies 20 not-too-crowded pages.

This year's budget indicates careful scrutiny of each item of the allotments requested by the several departments, there being no proportional cutting all down the line. Some items were decreased, a few increased, and ten were cut out altogether.

PUBLIC WORKS PHOTOGRAPHY.

In his annual report for the year 1917-1918, the city engineer of Salt Lake City, Sylvester Q. Cannon, makes the following references to changes in the engineering department's practice in the taking of photographs and blueprinting:

Owing to the increased cost of photographic plates it was deemed advisable, early in the year, to discontinue the making of sewer plat copies by this method, until the latter part of the year there were no copies made. It was then decided to try making the copies direct on photostat paper, which eliminates the negatives and reduces the cost to about five cents each, which is less than twenty-five per cent of the plate method.

The substitution of films for plates on account of their superior photographic merits, also their adaptability for filing and handling without breakage, was another change made by this division.

The following is a summary of the work done during the year:

Negatives made: 88, 8 inches by 10 inches; 98, 6½ by 8½ inches. Prints: 512, 8 inches by 10 inches; 120, 6½ inches by 8½ inches. Of the above 105 prints were made for the Street Department, 36 prints were made for the Law Department, 15 prints were made for the Water Department, 12 prints were made for the county surveyor. The cost per print during the year was $.63.

During the year 8,400 square feet of paper blue-prints were made at a cost of $.051 per square feet, 945.0 square feet of cloth prints at cost of $.135 per square foot, and 315.0 square feet of Van Dyke prints at $.097 per square foot.

XENIA'S TYPHOID EPIDEMIC.

There was an outbreak of typhoid fever in Xenia, Ohio, during the latter part of August and the first half of September, 1918, in which there were forty-four cases. The matter was investigated by the State Department of Health, which attributed the epidemic to defective hypochlorite used as a disinfectant.

All the epidemiological evidence pointed to the water supply as the source of infection, the cases being widely distributed, engaged in various occupations, none had eaten raw shell-fish nor attended public gatherings for some time prior to falling ill, and neither milk, ice cream nor fresh vegetables could be connected with the epidemic.

The city's water supply is obtained part from drilled wells and part from surface water. As the latter had been shown several times to be unsatisfactory, a hypochlorite disinfection plant was installed in 1914, about one-third of the city's consumption coming from this disinfected surface supply. The investigators found that the bleaching powder had been added in the definite prescribed quantities for more than two years, but on analyzing the bleaching powder it was found to be of only one-fifth the guaranteed strength. Quoting from the report: "Since this substance was guaranteed to be of proper strength, it follows that the undertreatment of the city's water was purely accidental; nevertheless, it is significant that such a possibility always exists when disinfection of the public water supply is necessary to render it safe for domestic use. In order to avoid the recurrence of a polluted water being supplied the consumers at Xenia, the water company should abandon the existing supply at the Springfield Pike station (the surface and ground water source) and procure water of satisfactory sanitary quality from another source. In the meanwhile, it is advisable that the company abandon its hypochlorite method of disinfection and employ the more dependable and up-to-date method using liquid chlorine."

Commenting on this report, the editor of the Ohio Public Health Journal expresses the opinion that two lessons are to be learned from this experience, one that no community should depend for its water supply upon disinfection only of an unsafe water, the second being that no purification plant can be operated safely without expert supervision. The human factor being all-important in disinfection by hypochlorite, the treatment renders water safe only when the chemicals are of good quality and the operator performs his duties unerringly. In this case, the superintendent was faithful in performing his duties in connection with adding the bleaching powder, but having no chemical training, did not detect that it was below normal strength. Bleaching powder should be abandoned in favor of liquid chlorine, which is not subject to deterioration such as occurred in Xenia, and the plant should be supervised by a technically trained expert, able to keep a careful check upon the quality of the disinfected water.

The WEEK'S NEWS

United States Starts Billion Dollar Road Building Campaign—Influenza Causes Death Rate Increase Throughout Country—Big California Power Systems Interconnect—Ohio Firemen Install Eight-Hour Day Themselves—Firemen's Pensions in New Jersey to Be Systematized—$34,000,000 Reconstruction Plans of St. Louis—State Commission Has Power to Raise Fares in Missouri—Federal Cooperation in Port Development—Government Housing Situation.

ROADS AND PAVEMENTS

Government Sponsors Great Building Boom.

Washington, D. C.—Highways, other public works, public utilities and houses are the object of a big campaign of building started by the government in order to help tide over the period of demobilization and reconstruction. Definite and practical steps have already been taken. An organization to conduct the campaign is now being created, with headquarters at 16 Jackson place, Washington, under the general supervision of Secretary Wilson of the Department of Labor, and with the cooperation of the American Federation of Labor and other labor interests. The following slogan has been adopted: "Build now for greater and better America. A billion for roads; two billions for public works; three billions for a million new American homes. What are you doing to help this campaign?" The Department of Labor, as one of the first steps in the campaign, is sending the following message to wage earners throughout the country: "Use your influence with your city fathers, your selectmen and other town officers to start at once municipal and town improvement." Cities and towns are being urged to build school houses, engine houses, roads, canals and other improvements. To those who believe that the cost of building will be less in a few years than it is now, the Department of Labor is replying that "probably 95 per cent of the cost of a residence ultimately goes to labor whenever a house is built, so that the cost is almost immaterial to wage earners as a class." Secretary Baker of the War Department is cooperating in the campaign, and has sent telegrams to the governors asking them to urge in inaugural messages the immediate resumption of building of every character. One of the first branches of the new activity of the government to be organized is the "Own a Home" branch, which has been placed under the direction of the Information and Education Service of the Department of Labor, of which Roger W. Babson is chief. Mr. Babson is creating an organization of assistants, headed by Franklin T. Miller, of New York City.

Congress Turns to Highway Legislation.

Washington, D. C.—Six bills dealing with highway construction were introduced in Congress in the last month. Senator Smoot has introduced a bill which provides for a complete reorganization of highway administration by the Federal Government while other bills would use present agencies. These are either amendments to the present Federal-aid highway law or utilize the organizations of the War and Post-office Departments. A joint resolution has also been introduced, which provides for the handing over to the Secretary of Agriculture by the Secretary of War of such war material as may be used in highway construction work. Senator Smoot's bill provides for the formation of a United States Highway Commission, to be composed of the chairman of the Senate Committee on Postoffices and Post Roads, the chairman of the House Committee on Roads and the Director of the Bureau of Public Roads. It proposes to issue bonds to the amount of $1,000,000,000, the proceeds of which will be distributed to the states in proportion to the average percentage of their percentages of population, total assessed valuation, and total mileage of public highways. When money is supplied to the states, they must deposit state bonds, drawing interest at 4 per cent, to cover the amount advanced to them. The 4 per cent interest shall pay the 3 per cent rate on the United States highway bond issues, and also establish a sinking fund to pay for these bonds. Long-time payments are provided for the state bonds. It is further provided that the Federal Government shall pay yearly to the depositing states 2 per cent of the amount deposited to be expended in maintenance. Of the four bills providing for the utilization of the present federal highway administration, those by Senator Bankhead and Senator Swanson, in the Senate, and Representative Browne in the House of Representatives, are practically identical. They are in the form of amendments to the present Federal-aid highway law and consist of a change in wording to permit a wider interpretation of the words "post road," to cover any road that might so be used. They also provide for the appropriation of $50,000,000, to be immediately available; $75,000,000, available July 1, 1919; $75,000,000, available July 4, 1920; and $100,000,000, annually to July 1, 1924. Another bill, introduced by Representative Shackleford, provides for a similar change in wording and for an appropriation not to exceed $150,000,000 per year. The other bill was introduced by Senator Swanson, and provides for the setting aside of 50 per cent of the net proceeds derived from the operation of motor trucks engaged in carrying parcel post, to be expended in the survey, construction, reconstruction, improvement, repair, maintenance and administration of such highways as might be selected by the Postmaster General for the transportation of mail.

Memorial Trees for Louisiana Highways.

Baton Rouge, La.—In memory of her sons who gave their lives in the war, Louisiana is planning to plant 440 miles of "victory oaks" and other suitable trees along Jefferson Highway, the state's principal road which runs from north to south and connects with the highway that extends all the way on to Winnipeg, Canada. The plan advocated by the American Forestry Association has been approved by Governor Pleasant, who declares that "no more fitting memorial could be reared to our soldiers, dead and living." The details of the memorial have been turned over by him to M. L. Alexander, head of the Department of Conservation. The trees will stand about forty feet apart. Oaks will be used wherever possible, although in some parts of the state other trees will thrive better.

SEWERAGE AND SANITATION

Great Death Rate Increase Due to Influenza.

Washington, D. C.—The recent influenza epidemic caused 111,688 deaths in the forty-six largest cities and increased the combined death rate for those communities in 1918 to 19.6 per thousand, according to statistics made public by the Census Bureau. Total figures for the country were not available. Baltimore, with 26.8 per thousand, and Nashville, with 26.4, had the highest rates of registration cities, while St. Paul, with 13.9, and Minneapolis and Grand Rapids, with 14 each, had the lowest. Grand Rapids showed the smallest increase, the death rate for 1917 having been 13.1. There were 442,374 deaths in the forty-six cities, the estimated population of forty-two of which aggregated 20,514,520. There was no estimate of population for the other four.

Deaths from influenza totaled 69,439, with 42,149 deaths from pneumonia. The year's total death rate in New York City was 13.8 per thousand, compared with 15.2 for 1917. In Chicago it was 17.1, against 14.9 the year before, and in Philadelphia, where the influenza epidemic was very severe, it was 24.2 compared with 17.1 in 1917. The rate in Cleveland was 16.0 for last year and 13.9 in 1917, Boston 22.0 and 16.4, St. Louis 17.6 and 15.1, Pittsburgh 25.4 and 18.2, and Los Angeles 16.4 and 12.5. In San Francisco the rate was 20.5, compared with 15.0 for 1917, in Buffalo 21.2 and 16.4, Milwaukee 14.4 and 12.8, Newark, N. J., 19.5 and 14.2, Cincinnati 20.6 and 16.5, Washington 23.6 and 16.8.

Typhoid Fever Epidemic Spreading.

Huntingdon, Pa.—A typhoid fever epidemic here is fast assuming serious proportions, and fifty-five cases have been reported to the office of the state department of health. Dr. B. Franklin Royer, acting commissioner of health, said that additional evidence is accumulating against the water supply of Huntingdon. Seven out of fourteen of the first samples of water collected by the department of health's sanitary engineers indicate colon bacillus.

$35,000 to Fight Influenza.

Los Angeles, Cal.—The city council has voted to appropriate $35,000 to be used by Dr. L. M. Powers, city health commissioner, to combat influenza. The council voted to place no restrictions upon his use of the money. Dr. Powers and a special business men's committee made the request for the appropriation after a conference in the office of mayor Woodman. There have been 40 inspectors at work, and due to their efforts, Dr. Powers said, the quarantine is more effective. He attributed the decrease in the number of cases to this fact, and the fact that the schools had been closed again. Ninety more inspectors were put to work.

STREET LIGHTING AND POWER

Greater Interconnections of Coast Power Systems.

San Francisco, Cal.—Following proposals by Major George F. Sever, Pacific Coast representative of the Power Section of the War Industries Board, a committee of engineering representatives of three power companies centering at San Francisco have held a series of meetings to consider additional interconnections between their transmission systems. At the conferences the Pacific Gas & Electric Company was represented by F. G. Baum and P. M. Downing, the Sierra & San Francisco Power Company by J. E. Woodbridge, and the Great Western Power Company by W. G. B. Euler. In the discussions the three properties were considered as one system and a study was made of the possible advantages to the entire network to be expected from further interconnections. Between the Pacific and Great Western systems and between the Sierra and Great Western systems no further interconnections were justified, it was agreed. Between the Pacific and Sierra systems, however, another interconnection between the high-voltage network near the south end of San Francisco Bay was found desirable and was recommended. The Port Marion substation of the Sierra company would ultimately be the better transmission center it was agreed, for the various lines radiating from the south end of the bay. For the present, however, the best plan would be for the Pacific company temporarily to terminate its 100,000-volt line at Mission San José and step down to 50,000 volts at that point. Then a 100,000-volt branch about a mile long should be built from Mission San José to connect with the main line of the Sierra system. The Sierra company at this part of its system operates at about 105,000 volts, varying between 102,000 and 108,000 volts. It was the opinion of Pacific company representatives that its voltage could be brought within the same range, making unnecessary any voltage-varying devices especially for interconnection purposes. The committee agreed that this interconnection would have "the following inherent advantages that will prove of value to both companies": (1) A greater utilization of the hydroelectric energy that may be available at any time of the year, making it possible to combine the steam plant standby service better, at least during a certain part of daily and yearly operation. (2) Improvement in the daily and seasonal load factor and power factor of the two systems as a whole, thus utilizing to better advantage the plant and transmission capacities of the systems. (3) Adding an insurance feature to the service and thus reducing the capital charge of the individual companies for this purpose. It was also thought that at some future time a consolidated substation at the south end of the bay would result in a reduction of capital and operation cost and in more effective operation.

Commission Declares Plant Inefficient.

Lamar, Colo.—In authorizing the Intermountain Railway, Light & Power Company to increase electric rates in Lamar the Colorado Public Utilities Commission says in its decision: "The Lamar plant of the Intermountain Railway, Light & Power Company is a very inefficient one, the coal consumption being in excess of 16 lb. of bituminous coal per kilowatt-hour of output. While it is fully realized that this condition cannot be corrected at this time on account of the difficulty in securing equipment, the company is not entitled to any reward for efficient operation in the disposition of this case. The cost of steam-power plant generation alone for the year 1917 was 70 per cent of the operating revenues for that period, and this ratio will probably be increased for the year 1918. There is also a very high unaccounted-for loss in distribution, which, in the opinion of the commission, does not result largely from leakage through trees, as stated in testimony. The serious problem before the commission, the company and the citizens of Lamar is that of providing sufficient revenue to enable the company to meet operating expenses necessarily incurred. It would be idle at this time to discuss the proposition of providing more efficient equipment for the purpose of reducing operating expenses. Such equipment, even if available, has so advanced in price that its substitution for the present equipment, even if obtainable, might not be desirable on account of the increase in fixed charges which would result. The commission is of the opinion that the rates of the applicant are unremunerative under the conditions prevailing at this time."

WATER SUPPLY

City Buys Water Works.

Ashland, Ky.—The city has purchased the plant of the Ashland Waterworks Company for $356,000. This action ends a suit as to ownership which has been fought through the various courts for the past ten years.

Condemnation Proceedings to Increase Supply.

Bayonne, N. J.—Condemnation proceedings to increase Bayonne's water supply have been sanctioned by the city commissioners. As a result the amount of water to be supplied the city daily will be increased by four million gallons a day up to 1920 and by five millions daily after that date. Resolutions adopted on Jan. 18, 1916, called for 16,000,000 daily until 1920, 20,000,000 daily from 1920 to 1925 and 25,000,000 gallons daily from 1925 to 1930. The latest resolution changed the amount to 20,000,000 gallons until 1920 and 25,000,000 per day thereafter. The resolutions also called on the East Jersey Water Company to pay the city of Bayonne each quarter its share of the cost of the water diverted.

West Orange, N. J.—This city has received notice that it would be unable to secure its supply of water from the Commonwealth Water Company because of an injunction secured against the company by the Weidmann Soap and Dyeing Company of Paterson. The company secured the injunction against the water company to restrain it from diverting water from the Passaic River above Little Falls. The injunction affects Paterson, Bloomfield, Rutherford, Glen Ridge, West Orange, Bayonne and Jersey City. The

only relief for these communities is to institute condemnation proceedings. They had until Jan. 9 to act before their water supply was to be cut off.

FIRE AND POLICE

Firemen Install Eight-Hour Day Themselves.

Cleveland, O.—Two-thirds of the fire department force of 585 men went off duty as a result of the Firemen's Union's plan to institute an eight-hour working schedule. The amendment to the city charter granting the firemen and policemen an eight-hour day was approved by the voters in 1917. It was never enforced, city administration officials say, because of lack of finances. One hundred and ninety members—one-third of the department—left their posts at midnight. Another one-third walked out at 8 o'clock next morning. The remainder were relieved at 4 o'clock in the afternoon by the first unit, which remained on duty until midnight, when the second group relieved them. According to union officials, all the firemen will report in any great emergency. Mayor Davis issued a statement saying that "the city will fill as soon as possible the vacancies of those who have voluntarily taken it upon themselves to leave their post of duty." Discharged soldiers and sailors and men out of employment were appealed to take their places.

To Systematize Firemen's Pensions.

Trenton, N. J.—The Pierson Pension Commission has given a hearing on the firemen's pension fund in order to enact the best legislation possible in the interest of firemen's pensions. Chairman Arthur N. Pierson explained to about fifty representatives of the firemen's pension fund that two years ago the Legislature found that there was a tremendous flood of pension amendments to existing systems, and it was thought that it was time to look into the matter in a systematic way. He explained a proposed pension bill providing for the establishment of municipal pension funds and their central supervision through a state commission.

Climbs Through Fire to Save Flag.

New York, N. Y.—Alfred Hovorka, driver of Engine 32, at a recent fire climbed through a circle of fire to the tip of a flagpole and saved the American flag from being destroyed by the flames. A big crowd, gathered to watch the fire, cheered and applauded the fireman's act. Before the fire was out, four offices on the third and fourth floors of the building had been burned out, with damage estimated at $10,000.

GOVERNMENT AND FINANCE

May Sue State in Its Own Courts.

Columbus, Ohio.—Ohio Supreme Court decrees holding that a state constitutional amendment permitting suits against that state in its own courts is not effective without legislation have been in effect sustained by the U. S. Supreme Court at Washington. The court dismissed proceedings brought to recover damages resulting from the construction by the Ohio board of public works of a reservoir in Mercer county.

Reconstruction Plans of St. Louis.

St. Louis, Mo.—The City Plan Commission has published a pamphlet entitled "St. Louis After the War," containing the results of investigations of public improvements totaling $93,972,000. These do not include transit or housing. Estimates made by city department heads, presumably with a view to the more immediate needs of the city, total about $34,000,000. The available borrowing capacity of the city, under a 5 per cent bond limit, is $23,500,000. The City Plan Committee of the Chamber of Commerce, with a membership of 75, recently voted in favor of $22,000,000 bond issue. Mayor Kiel has appointed a citizens' committee of 25 members to act with city officials in canvassing the whole situation. This committee includes a number of architects and engineers and has as chairman John L. Mauran, president of the American Institute of Architects. The $34,000,000 estimate made by department heads is as follows:

Improvement of River des Peres	$11,780,000
Repair and construction of sewers	5,655,000
Parks and playgrounds	6,005,500
Municipal convention hall	2,500,000
Municipal farm	700,000
Robert Koch Hospital improvements	200,000
Municipal railroad and docks	2,100,000
Elimination of grade crossings	3,142,200
City's share of street openings	600,000
Garbage reduction plant	550,000
Department of Streets and Sewers	450,000
New fire engine houses and equipment	400,000
Municipal garage	125,000
Additional cells in city jail	100,000
Total	$34,227,700

These items agree in a general way with the estimates of the City Plan Commission for the same objects. In addition, the commission put down $25,000,000 for river-front improvements, $20,000,000 for water-works, and $15,000,000 for public buildings and a group plan. The water-works extension may be financed outside the bond limit.

Mayor Gets $12,000 Gift.

New Bedford, Mass.—Mayor Charles S. Ashley, who on Jan. 1 was inaugurated for his twentieth term, was the recipient of a purse of $12,000. The presentation was made on behalf of eighty manufacturers and merchants in appreciation of the mayor's long service to the city.

Sewer Work Held Up by Bond Firm.

Detroit, Mich.—Refusal of Merrill, Oldham & Co., bond brokers, of Boston, to purchase $988,700 worth of Detroit sewer bonds for which they were high bidders, may tie up almost the entire 1919 sewer program. The main part of the work was to be the Third street sewer, construction of which was to have begun at once, in order that the outlet might be completed before navigation opened. The Boston company, through its attorneys, Storey, Thorndike, Palmer & Dodge, has notified city controller Engel that it considered the proposed bonds invalid, as they were not approved by a three-fifths vote of the people, as provided in the charter. Mr. Engel, in an informal opinion, told the ways and means committee of council he thought they were valid and it is probable that a settlement of the question will have to be made in the courts. H. H. Esselstyn, commissioner of public works, told the committee the work must be done at once at any cost and that the contractors, J. A. Mercier and George Cooke, were willing to finance the work themselves if they were given proper guarantees the money would be paid. But it was pointed out the city could not guarantee more than 7½ per cent of the amount, this being the limit the municipality is permitted to borrow in advance of a bond issue. It was the Merrill-Oldham company bid on these bonds which caused much comment several weeks ago. The company, after making a sealed proposal, telegraphed an additional offer of $10 a bond, and when the bids were opened it was found the company would have been high bidder without this extra. The telegram thus cost the company $9,887.

TRAFFIC AND TRANSPORATION

Court Decides Commission Has Fare Raise Power.

St. Louis, Mo.—The state supreme court has handed down a decision in the 6-cent fare case of the United Railway which upholds the raise in rate awarded by the public service commission. In an opinion written by judge A. M. Woodson the court reversed and remanded the decision of circuit judge J. G. Slate of the Cole county circuit court, who held that the commission was without jurisdiction to grant the increased fare. Judge Woodson held that Sec. 20 of Art. XII. of the State Constitution, on which city counselor Daues relied chiefly in his opposition to the fare increase, did not apply. Mr. Daues contended that under this section the state could not take away the

power from the city to regulate the rates of a railway fixed by franchise ordinance. The 6-cent fare became effective last June, after the United Railways had asked permission to increase rates to meet the demands of employees who had walked out on strike in February. Chairman W. G. Busby of the commission wrote the opinion granting the fare increase, and it was concurred in by commissioners Noah Simpson and Edward Flad. Commissioners David W. Blair and E. J. Bean dissented on the question of jurisdiction. Proceedings were started in the Cole county circuit court by counselor Daues for the city of St. Louis to upset the fare increase. When circuit judge Slate held the commission was without jurisdiction, the railway appealed to the supreme court. Chief justice Bond then granted an order permitting the company to continue to collect the extra 1-cent fare, which he directed to be impounded until the final determination of the case.

Towns Subsidize Street Railway.

Great Barrington, Mass.—The towns of Great Barrington, Sheffield and Egremont have taken advantage of the legislative act of 1918, which permits municipalities to give aid from their treasuries to electric railways and have made appropriations for the assistance of the Berkshire Street Railway. Their action is said to be without precedent in the commonwealth.

CITY PLANNING AND HOUSING

U. S. Shipping Board Asks Co-operation in Port Development.

Washington, D. C.—E. F. Carry, chairman of the Port and Harbor Facilities Commission of the United States Shipping Board, has sent a letter to the officials of cities so located as to permit of port developments. In outlining the scope of the program to be pursued by the Port and Harbor Facilities Commission, Mr. Carry asserts that one of the most essential requisites to the upbuilding of the maritime commerce of the United States is the establishment of a national zoning system under which the exports and imports of the country will flow through those ports that are within economic transportation distance of the points of origin and destination. He says in part: "The markets of the world offer unprecedented opportunities for the exportation of American products. The United States Shipping Board is rapidly producing the ships to carry those products. There is urgent need, however, for extensive improvements in many departments of our maritime commerce. There must be a great increase in the number of dry docks; new methods must be adopted to increase the efficiency of available port and harbor handling appliances; the most improved modern equipment must be substituted as rapidly as possible for much now in use, and additional facilities must be provided where needed; there must be perfect co-ordination between the shipping interests of every port in order that the tonnage of our merchant marine may be utilized to the limit of its capacity; and the congestion of traffic in some of our ports must be relieved by a systematic and economical distribution of exports and imports. A careful study of these problems has convinced the Port and Harbor Facilities Commission that one of the most essential requisites to the upbuilding of the maritime commerce of the United States is the establishment of a national zoning system under which the exports and imports of the country will flow through those ports that aee within economic transportation distance of the points of origin and destination. Investigations made by the commission in co-operation with the United States Railroad Administration demonstrate that such a system is not only practicable, but that its adoption will facilitate the general movement of the freight as well as stimulate and expedite the maritime commerce of the country.

"The success or failure of the Port and Harbor Facilities Commission in the work it has undertaken depends upon its ability to obtain the co-operation of those state and municipal authorities whose cities front upon our coasts, and of every commercial and industrial enterprise engaged in the export and import trade. This is especially true of those improvements and extensions that must be made in the equipment of its ports and harbors if the United States is to play a part in the maritime commerce of the world commensurate with the position it now holds among nations.

"The impression prevails that the United States Shipping Board will finance port and harbor improvements. That impression is erroneous. Such improvements must be made through private or public enterprise. The Port and Harbor Facilities Commission will render every assistance within its power to improve the facilities and promote the business of every port and harbor of the United States. Its investigations are being made with that end in view and its energies are being concentrated upon the expeditious accomplishment of that object. It firmly believes, however, that the best guaranty of success of a port lies in the investment in port and harbor improvements by those interested in the industrial commercial activities of the territory naturally tributary to the port. The commission is convinced that both local and national interests will best be served by the appointment of a port commission for every port on our coasts at which there is no such commission at present, and by confering upon existing commissions such additional authority as may be necessary to co-operate all municipal, industrial, commercial and railroad interests centering at such ports.

"The commission bespeaks your active co-operation in putting this plan into effect at the earliest possible moment.

"It is our desire and purpose to keep in constant touch with every port commission, and we shall be obliged if you will inform us of the personnel of the commission at the first opportunity. The data collected by this commission and the advice and assistance of its experts will always be at the disposal of the local commissions.

"In this connection the commission urges that it be consulted in regard to all improvements of port and harbor facilities, and that the plans for such improvements be submitted in order that adequate facilities be assured at every port.

"We shall be glad to receive any expression of your views on the subject to which we have referred, especially in regard to the local commission, and we shall be greatly obliged if you will communicate with us at your earliest convenience."

Unfinished Government Housing Would Be Loss.

Washington, D. C.—Suspension of work on all Government housing projects not 75 per cent complete, as threatened in a resolution passed by the United States Senate and now before the House of Representatives for action, will cause the loss of millions of dollars, according to a statement by Lawrence Veiller, secretary of the National Housing Association. The resolution has been adopted by the Senate, upon the ground that it would save money to the taxpayers of the country. "The officials of the United States Housing Corporation of the Department of Labor, which has the projects in charge, and the directors of the National Housing Association, a disinterested body of housing experts, however," says the statement, "point to the depreciation from physical causes which must inevitably result to the large number of unfinished houses from their indefinite exposure to the elements in an unfinished state, and to the complications and losses which would result from a wholesale cancellation of contracts as sufficient argument that no such saving would result from the proposed action, but that, on the contrary, millions of dollars would be lost, which, on completed buildings might readily be salvaged. Neither the officials of the Housing Corporation nor the directors of the National Housing Association are advocating permanent Government ownership of these houses, nor a continuation of the Government in the housing business. They merely urge that any action taken by Congress at this critical time be based upon a more thorough-going investigation than has yet been accorded the matter. Should the resolution, in the form in which it passed the Senate, pass also the House, a state bordering on havoc would be created." The National Housing Association is making an effort to have the Senate resolution killed in the House of Representatives. The resolution now is in the hands of the House Committee on Building and Grounds, of which Representative Frank Clark of Florida, is chairman.

NEWS OF THE SOCIETIES

Jan. 13.—AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Annual meeting, New York City. Deputy secretary, B. Etchelle, 85 Nassau St., New York City.

Feb. 18-21, 1919.—AMERICAN ROAD BUILDERS' ASSOCIATION. Sixteenth annual convention and Ninth American Good Roads Congress under the auspices of the A. R. B. A., Hotel McAlpin, New York, N. Y. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

Nov. 12-14, 1919.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

Governors' Conference.

Two-thirds of the states in the Union were represented by governors and governors-elect at the recent governors' conference held at Annapolis, Md. Little of direct interest to municipalities was brought out, although a number of large national problems of concern to the cities were discussed. Cabinet Secretaries Baker, Houston, Daniels, Lane and Wilson addressed the delegates.

Governor Harrington, who acted as official host in behalf of Maryland, opened the conference with an address of welcome, and the response was by Governor Manning of South Carolina.

Secretary Baker said that the war had proved the indispensability of strong state governments, in peace as well as war time, as the principal agencies for mobilizing and demobilizing armies, finding work for returning soldiers, and developing better methods of physical training for young men. At the same time he pleaded that state authorities give cities more freedom to work out their individual local problems.

The War Secretary emphasized that one of the principal functions of states hereafter must be "to rescue young men from the situation shown during the recent mobilization, when one-third of the drafted men were found to be physically undeveloped or defective."

Governor Harrington of Maryland said: "The surest way to avoid socialism or anarchy is to have forms of government and legislation that give equal and just rights and equal and just opportunity to every citizen. Public utility corporations and big business must now understand that they can only exist when they recognize that their existence is permitted only for service and not for self, and that they are servants and not masters."

National Highways Association—Bridge Division.

Recent measures taken to organize a committee of bridge engineers as a Division of Bridges of the National Highways Association are to be continued at a meeting of the committee January 17 in New York City. A tentative outline of the program of work which this committee will undertake includes consideration of the subject of highway crossings over large rivers, advice and assistance in the broader preliminaries of highway bridge projects, and related matters in which special knowledge of bridge engineering may be made of service to highway development. The division will carry on its work on the principle of taking the initiative in any particular case only when called upon to do so. The functions of the committee are planned exclusively for service to the public good. Further development of the program of future work is expected to come about through the meeting on January 17. G. Lindenthal is chairman of the division, and C. E. Fowler is secretary.

American Society of Civil Engineers.

The Committee on Developments of the American Society of Civil Engineers, at its recent meeting in Chicago, decided to divide its work into four principal groups, appointing a subcommittee for each group. The committee also passed resolutions outlining future work, including recommendations that the society adopt the principle of becoming an active force in national affairs; that the importance of engineering in the reconstruction period should be brought forward nationally, and that the subjects assigned to the subcommittees should be discussed at the annual meeting of the society in January.

An executive committee was appointed, consisting of the following members: Onward Bates, chairman; Baxter L. Brown, W. L. Darling, H. L. Haehl, E. S. Nethercut, Frederick C. Noble and H. R. Safford.

The four divisions of work assigned to the subcommittees are:

Technical Activities, including (1) meetings, papers, and committee work; (2) sections or divisions of the society for specialized lines of work; (3) cooperation with specialized engineering societies and other organizations, and (4) standards in engineering practice.

Internal Relations and Local Associations, including relations with (1) local associations; (2) cooperation between the society's local associations and those of other national societies and local societies; (3) rearrangement of the grades of membership; (4) student engineers; (5) young men of the profession, and (6) personal service bureau.

External Relations with the Engineering Profession, including relations (1) with other national societies and related organizations; (2) with local societies other than the relations referred to above; (3) amalgamation of engineering societies, and (4) American engineers in foreign service.

Relations to Public Affairs, including (1) professional status of the engineer; (2) legal status of the engineer, and (3) public status of the engineer.

Committee on technical activities: Robert A. Cummings, chairman, and George R. Putnam. The chairman of this subcommittee was authorized to name three other members.

Committee on internal relations and local associations: Frederick C. Noble, chairman; Richard L. Humphrey, George G. Anderson, Edgar S. Nethercut, Gardner S. Williams, Clifford M. Holland, H. L. Haehl, George C. Mason and J. H. Brillhart.

Committee on external relations with the engineering profession: S. Everett Tinkham, chairman; Thomas L. Wilkinson, E. B. Thomas, William H. Hoyt, Arsene Perrilliat, H. R. Safford, and Arthur Pew.

Committee on relations to public affairs: W. L. Darling, chairman; J. C. Ralston, Charles Hansel, George Butler, Frank T. Darrow, C. J. Tilden, John L. Hall, B. L. Brown and Paul G. Brown. This subcommittee may appoint its own divisions.

It is the intention that the subcommittees shall analyze and study the available data and information, and the recommendations of these subcommittees will be considered by the Committee on Development.

The committee will keep in close touch with the work of similar committees of the other national engineering societies, and will endeavor so to co-ordinate its work as to be, as nearly as practicable, in harmony with their action on related matters of common interest. The committee will thereafter submit its final report with its recommendations.

United States Good Roads Association.

The seventh annual convention of the United States Good Roads Association will be held April 14-19, 1919, at Mineral Wells, Texas.

American Institute of Consulting Engineers.

A meeting is to be held on January 13 by the American Institute of Consulting Engineers. The subject to be considered will be "The War and Reconstruction."

New York State Tax Association.

The eighth conference on taxation and the meeting of all assessors in New York State is announced for January 22, 23 and 24 in Albany under the joint auspices of the State Tax Commission and of the State Tax Association. At the opening session addresses of welcome will be delivered by governor Alfred E. Smith and mayor James R. Watt of Albany. Professor Edwin R. A. Seligman also will speak.

Ohio Road Congress.

The second annual session of the Ohio Road Congress will be held at Columbus, O., January 14, 15 and 16.

At this time will be held the regular annual meetings of the Ohio Good Roads Federation, the Ohio Engineering Society and the County Commissioners' Association of Ohio. The congress will have the co-operation of the state highway and agricultural departments, the State University, the State Grange, the postmasters of the state, the local chambers of commerce, the State Highways Transport Committee of the Council of National Defense, the Ohio State Automobile Association, the Ohio Contractors' Association, the Ohio Auto Trades Association, the Ohio Paving Brick Manufacturers' Association, the Ohio Macadam Association, the Ohio Sand and Gravel Association and the Portland Cement Association.

The state legislative program dealing with highways will receive particular attention.

INDUSTRIAL NEWS

Iron and Steel.—The pig iron market has experienced a general decline of $3 a ton. The decline is to be viewed in connection with the schedule of iron and steel price reductions which the committee of the American Iron and Steel Institute had prepared for submission to the Committee of the War Industries Board at the meeting of December 11, but which the committee of the board refused to consider, as it did not intend to indulge in further price fixing. The steel trade immediately adopted the suggested reductions in steel products, but the merchant blast furnaces held off, and only in the last few days have they reduced their quotations.

The whole iron and steel market is in an extremely quiet condition. Producers see no indication that the market will become active in the near future, and rather look for a dull market for three months or thereabout. There is a moderate amount of specifying on old contracts, but scarcely any strictly new business.

New construction of steel-making capacity in the United States in the last year has amounted to a shade less than 2,000,000 tons of rated capacity in ingots. The total new construction since the war started in 1914 amounts to nearly 11,000,000 tons of rated capacity, probably equal to the actual production of 10,000,000 tons, and the total steel-making capacity of the United States, including steel castings, is nearly 50,000,000 tons. This is about one-half greater than the actual production in any calendar year prior to the war. During 1918 production was restricted by various influences, and the actual production was only about 42,000,000 tons, with somewhat more than a million tons of steel castings in addition.

With very few exceptions all the iron and steel pipe mills have issued their new discount cards showing a three-point reduction in prices, and they are all dated January 1, 1919. The new cards cover steel pipe, iron pipe and steel boiler tubes. The new basing discount on standard steel pipe is 54 per cent., this applying on three-quarters to three-inch butt weld.

Keen interest was aroused in the steel trade by the announcement of the Department of Justice that as all price control would end December 31 sellers who should thereafter undertake to fix prices, even reduced prices, would have the attention of the department. It was the announcement rather than the principle involved that attracted attention. While the steel industry was not mentioned in the statement, there is a disposition to couple the department's disapproval of "concerted" price changes, even if they are reductions, with the fact that less than three weeks before the steel industry had made price reductions that were both general and specific, even though they may not have been concerted. In the iron and steel trade there has been a hope that the custom of quarterly price fixing might be continued in one form or another, and it had already been suggested, prior to the attempt to have the War Industries Board fix prices for the first quarter of 1919, that some plan might be devised whereby, when the quarter ended, a fresh schedule for the second quarter might possibly be promulgated to the trade at large with the connivance or assistance of some department of the Government. The Department of Commerce had even been suggested in this connection, also the Department of Labor.

American Wood Preservers' Association.

The fifteenth annual meeting of the American Wood Preservers' Association is to be held in St. Louis January 28-29. On the following two days a meeting of the tie producers of the country, to effect a national organization, will be held under the auspices of the tie and timber division, St. Louis Chamber of Commerce, in order to bring together both producers and users of cross ties.

In order to fit together the programs of the two bodies, the meeting of the American Wood Preservers' Association has been curtailed to two days, with three sessions on the first day and two on the second, concluding with a joint dinner with the National Tie Producers' Association. A session on the first day of the meeting will be devoted to consideration of the preservative materials situation, and a session on the second day to the tie problem.

Walter A. Zelnicker Supply Co., 325 Locust street, St. Louis, Mo., in its January, 1919, bulletin (No. 250), offers a large line of construction equipment. The list ranges from marking crayons and spikes to 91-ton locomotives and to power plants. It includes attractive bargains in cranes, cars, dump cars, steam shovels, air compressors, boilers, car loaders, condensers, drills, elevators, engines (gas, gasoline and steam), generators, motors, pipe cutting and threading machines, pumps, sand dryers, buckets, concrete mixers, forms, conveyors, crushers, derricks, drag lines, graders, hoisting engines, pipe, trenching machines, road rollers, tanks, etc.

Material-Handling Machinery Manufacturers.

At a recent conference of committees representing material-handling machinery manufacturers held in New York for the purpose of considering ways and means for improving cargo handling at ports of the United States in conjunction with the Port and Harbor Facilities Commission of the United States Shipping Board, steps were taken to make permanent the organization of what will be known as the Committee of Material-Handling Machinery Manufacturers' Associations. This new body will comprise four groups of manufacturers, represented by the following committees:

Class 1—Trucks, Tractors and Trailers: F. W. Conlin, the Crescent Truck Co., 30 Church street, New York, chairman; L. C. Brown, the Elwell-Parker Electric Co., 50 Church street, New York; R. P. Kennedy, the Baker R. & L. Co., New York.

Class 2—Gravity and Power Conveyor Apparatus: B. H. Alvey, the Lamson Co., chairman, Boston, Mass.; F. E. Moore, the Mathews Gravity Carrier Co., Elwood City, Pa.; E. R. Humphrey, the Link-Belt Co., Philadelphia.

Class 3—Cranes, Hoists and Winches: J. A. Shepard, the Shepard Elec. Crane & Hoist Co., Montour Falls, N. Y.; L. H. Libby, the Sprague Electric Works, Bloomfield, N. J., and member Electric Hoist Manufacturers' Association; H. W. Davis, the American Hoist & Derrick Co., St. Paul, Minn.

Class 4—Elevators: R. W. Scott, the Otis Elevator Co., Thirty-sixth street and Eleventh avenue, New York; D. V. Jenkins, the Watson Elevator Co., 407 West Thirty-sixth street, New York, and member Elevator Manufacturing Association of New York; O. P. Cummings, the A. B. See Electric Elevator Co., 220 Broadway, New York, and member Elevator Manufacturers' Association of the United States.

PERSONALS

Governor William C. Sproul of Pennsylvania has appointed Dr. Edward Martin of Philadelphia state commissioner of health and Colonel Louis S. Sadler, Carlisle, state highway commissioner.

Connolly, Frank A., has been chosen by unanimous vote of the city commission of New Brunswick, N. J., as commissioner to take the place of mayor Edward F. Farrington, who died recently. Commissioner John J. Morrison was appointed mayor.

Landreth, William B., has been named chief of the board of consulting engineers, New York State Canal System, succeeding Joseph Ripley. Mr. Landreth has been connected with the canal system of the state for many years and has served as deputy state engineer during the administrations of State Engineer Williams.

Hughes, T. C., Tulsa, Okla., has been appointed consulting engineer to supervise the construction of hard-surfaced roads to be built by Tulsa County under the $1,700,000 bond issue voted last year. He will co-operate with D. W. Patton, county engineer, who will be engineer of construction.

Roper, Roswell M., for the past year acting engineer for the water department, East Orange, N. J., has been appointed engineer of the department

Chapin, Roy D., chairman of the Highways Transport Committee of the Council of National Defense, has resigned. Mr. Chapin, who is president of the Hudson Motor Car Company, returns to his business in Detroit after a year's service in Washington helping the Government energize the highways of the country and increase the flow of commodities over them. The work of the Highways Transport Committee will be taken up by John S. Cravens, chief of the Field Division, Council of National Defense.

Municipal Journal

Volume XLVI NEW YORK, JANUARY 18, 1919 No. 3

STREET CLEANING REPORT FOR ROCHESTER

Recommendations for Organization of Force, Municipalization of Collection Service and Purchase and Use of Equipment—Data Concerning Work Done by Street Cleaning Force—Stables and Shops.

There has just been made public a report prepared last year by the Bureau of Municipal Research of Rochester, N. Y., which report gives the result of a study, undertaken at the request of the commissioner of public works, made by John T. Child, assistant engineer, working under the supervision of James W. Routh, chief engineer of the bureau. The aim of the report is the betterment of the street cleaning service in Rochester, and the study necessarily involved a thorough investigation of existing conditions. The report sets forth in considerable detail the conditions as ascertained, and also the recommendations of the bureau as to both the organization and control of the force and the methods and equipment to be employed. The report occupies 133 pages of text, and contains 38 tables, 26 photographs and 12 maps, diagrams and charts.

While many of the features and practices described in the report can be found duplicated in many other cities, the report will probably be most interesting and instructive to officials of other cities because of the measures and methods that are recommended rather than those that now exist. Consequently, in the following abstract of the report special consideration will be given to the recommendations, existing conditions being described chiefly where they serve to illustrate the recommendations or where they appear to be somewhat out of the ordinary.

ORGANIZATION OF FORCE.

In the "General Summary" which serves as an introduction to the report, there is presented first a consideration of the financial side of the problem, followed by one of the organization and distribution of the force. Concerning the latter, the engineers recommended as follows:

"The sanitary services should be reorganized and combined in a single organization unit to be known as the Bureau of Sanitation. This bureau should be headed by a general superintendent, responsible for all of the various sanitary services, including the operation of the garbage reduction plant and refuse incinerator, the disposal of ashes, the collection of garbage, rubbish and ashes, and street cleaning and snow removal. This coordination of functions would result in a bureau consisting of three divisions: a Division of Disposal Plants, a Division of Street Cleaning and Refuse Collection, and a Division of Stables and Shops.

"After a careful study of the various factors involved, it is believed that the most effective plan of organization for the proposed Division of Street Cleaning and Refuse Collection would be a combination of the functional and geographical plan of organization. The city would be divided geographically into five districts, and the work within each district would be supervised by functional officers reporting to the district superintendent. This plan of organization could be brought into effect without increasing the existing overhead expense of the services rendered.

"Any plan for reorganizing and improving the sanitary services must be based upon permanent employment for all officers and men engaged in this work. The sanitary services require, and actually have employed during the last two years, a minimum force consisting of 68 officers, 550 laborers and 130 teams. When permanent employment is accomplished, the force should be uniformed, from general superintendent to laborer; the officers should be provided with badges indicative of their position and responsibility and given authority to issue warnings and summonses for violation of the ordinances relating to the work; there should be provided a code of discipline whereby the men may be rewarded, or penalized for breaches of discipline; there should be a standardization of salaries, automatic increases in salary, dependent upon length and character of service, and an adequate pension system and medical care. In addition to this, provision should be made for the development of standard work methods, and the instruction of the entire force, including both officers and men, in

Street Dirt Census
(July 2-14, 1917, Inclusive)

District	Number of sweepers	Number of routes	Av. No. of tubs per day	Average cu. yds. dirt collected daily	Daily number tubs per man	Daily cu. yds. per man	Daily cu. yds. per route	Minimum and maximum tubs per man
1-E	24	22	121	19.4	5.05	.806	.88	3 -10
1-W	23	19	147	23.5	6.4	1.02	1.24	2 -12
II	27	24	209	33.4	7.75	1.24	1.35	2 - 9
III	30	28	270	43.2	9.0	1.44	1.54	2 -22.5
IV	37	37	162	25.9	4.4	.70	.70	2.5-10
V	38	30	193	30.4	5.08	.813	1.03	2 -13
VI	23	23	129	20.6	5.6	.896	.896	3 -10
VII	23	16	158.5	25.3	6.9	1.1	1.58	2 -12
VIII	47	47	813	130.0	17.3	2.77	2.77	4 -36
IX	24	20	117.6	18.8	4.9	0.784	.933	2 -11
Total	296	266	2,320	370.5				
Average	29.6	26.6	232	37.05	7.24	1.16	1.30	

NOTE—Dirt is collected in .16 cubic yard tubs and .72 cubic yard carts. One cart equals 4.5 tubs. Carts are dumped by sweepers and not picked up. All cart collections are reduced to tubs in above table.

RAINFALL—July 2-14, 1917—2.19 inches fell in 6 days.

these work methods. Knowledge of, and proficiency in, these methods should be made a prerequisite for employment on the permanent force.

"It is believed that municipal ownership of teams and the operation of a Division of Stables in the Bureau of Sanitation would prove no more expensive than the present system of hiring teams by the day; that it soon would prove more economical, and that better service undoubtedly would result. Therefore, it is recommended that steps be taken toward the purchase of sufficient teams to carry on the work of street cleaning and refuse collection, and that a Division of Stables and Shops be provided in the reorganized Bureau of Sanitation, one of whose functions would be the operation of the stables. The ownership of municipal stables would increase the number of men on the permanent force by about 130.

"The second function of the Division of Stables and Shops would be the operation of the repair shop. The existing repair shop should be, and soon must be, enlarged to meet the demands of the service. It is suggested that additional buildings be constructed to provide greater floor space, and that an adequate working force and sufficient machinery of various kinds be provided to handle the work."

As an indication of the detail with which the investigation was conducted, a record was kept during two weeks in July of the work done by the sweepers in each of the ten districts into which the city is divided. The records obtained are summarized in the table given herewith. Districts 1E and 1W are those portions of the business district lying on the east and west sides of the Genesee river, conditions in which are such as to make the cleaning in them more difficult than in the other districts.

The proposed force would consist of a general superintendent, an assistant general superintendent, 5 district superintendents, 5 district clerks, 3 inspectors, 22 foremen of ash and rubbish collection, one foreman of street cleaning and collection, 15 section foremen of street cleaning, 10 dump foremen, and 5 assistant superintendents in charge of garbage collection.

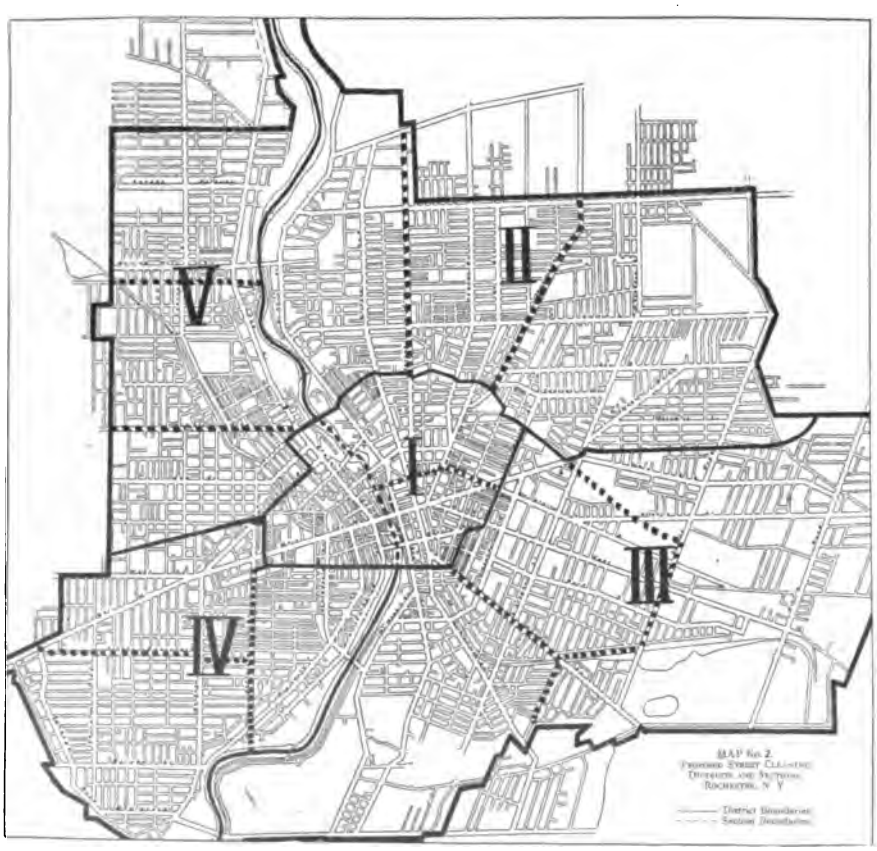
The assistant general superintendent would be responsible for street cleaning work done at night; in this connection it is interesting to note those paragraphs of the report referring to night work: "The nature of street cleaning is such that it requires almost continuous attention to keep things on the move, so that dirt or snow does not get ahead of the cleaning forces. Street cleaning at night becomes more important with the growth of a city, chiefly because the heavy traffic makes it impossible to do certain kinds of cleaning to the best advantage by day. . . .

"Night snow work is bound to be more effective and cheaper than snow removal by day, because traffic is then light and so will not hamper the men or compact the snow before it can be removed. . . .

"In summer, night street cleaning is more extensive if not more important than in winter and can be planned for ahead of time. Several necessary phases of street cleaning can be carried on to better advantage at night than in the daytime. These include both motor and hose flushing, sidewalk cleaning and litter patrol work. Machine sweeping would be well worth while on some of the Medina block pavements down-town, but it can be done satisfactorily only at night, when the car service is at a minimum and when there are few standing vehicles. Provisions should be made to carry on this kind of work at night in addition to that already attempted.

"Any adequate plans for street cleaning will make it necessary for the department to do night work extensively as a regular thing. It should be possible for one night superintendent in an automobile to supervise the work in summer without the assistance of foremen. Hand and machine flushing is done by two-men or three-men gangs which do not require foremen, but all branches of street cleaning need real supervision.

"It is plain that the position of night superintendent would be an important one, requiring intimate knowledge of every kind of work and involving considerable responsibility. . . . He should be in direct charge of all night work, consisting of hose flushing, machine flushing, wagon flushing, snow work, litter patrol and sidewalk sweeping (in the down-town district), and such machine sweeping as is done at night on heavy traffic streets."



PROPOSED DIVISION OF ROCHESTER INTO DISTRICTS AND SECTIONS FOR STREET CLEANING PURPOSES.

Concerning laborers, the engineers recommend that so far as possible all of the employees be made permanent, emergency labor being added only where absolutely necessary. "Emergency laborers are not only unacquainted with local conditions and methods, but they are unreliable. One day they are on the job and the next day gone. Many men who, of necessity, are put to work when occasion demands, are 'floaters' who work for a meal or drink and then quit. They frequently are insufficiently clad and poorly fed and usually are lazy, if not otherwise inefficient, and have to be under close supervision if any work is to be accomplished. Emergency labor can be reduced to a minimum only by the permanent employment and proper training of as many laborers as are necessary for year-round service."

In studying the question of size of force, it was found that during the winter months the number of laborers

employed for collecting ashes, garbage, etc., exceeded that needed for street cleaning most of the time; but as spring approached the collection force decreased, becoming less than the cleaning force in April and remaining considerably less until November. It was therefore proposed as a tentative provision that 200 men be employed permanently for street cleaning, 200 for refuse collection, and 150 as interchangeable between the two. This number would be increased, should city own all its team and stable them, by 96 drivers, 15 stable men and 15 hostlers.

It was recommended that a medical examining officer be provided for the Department of Public Works, which, although employing nearly 2,500 men, had no surgeon on its staff, but employed medical aid for accident cases which come under the labor compensation law.

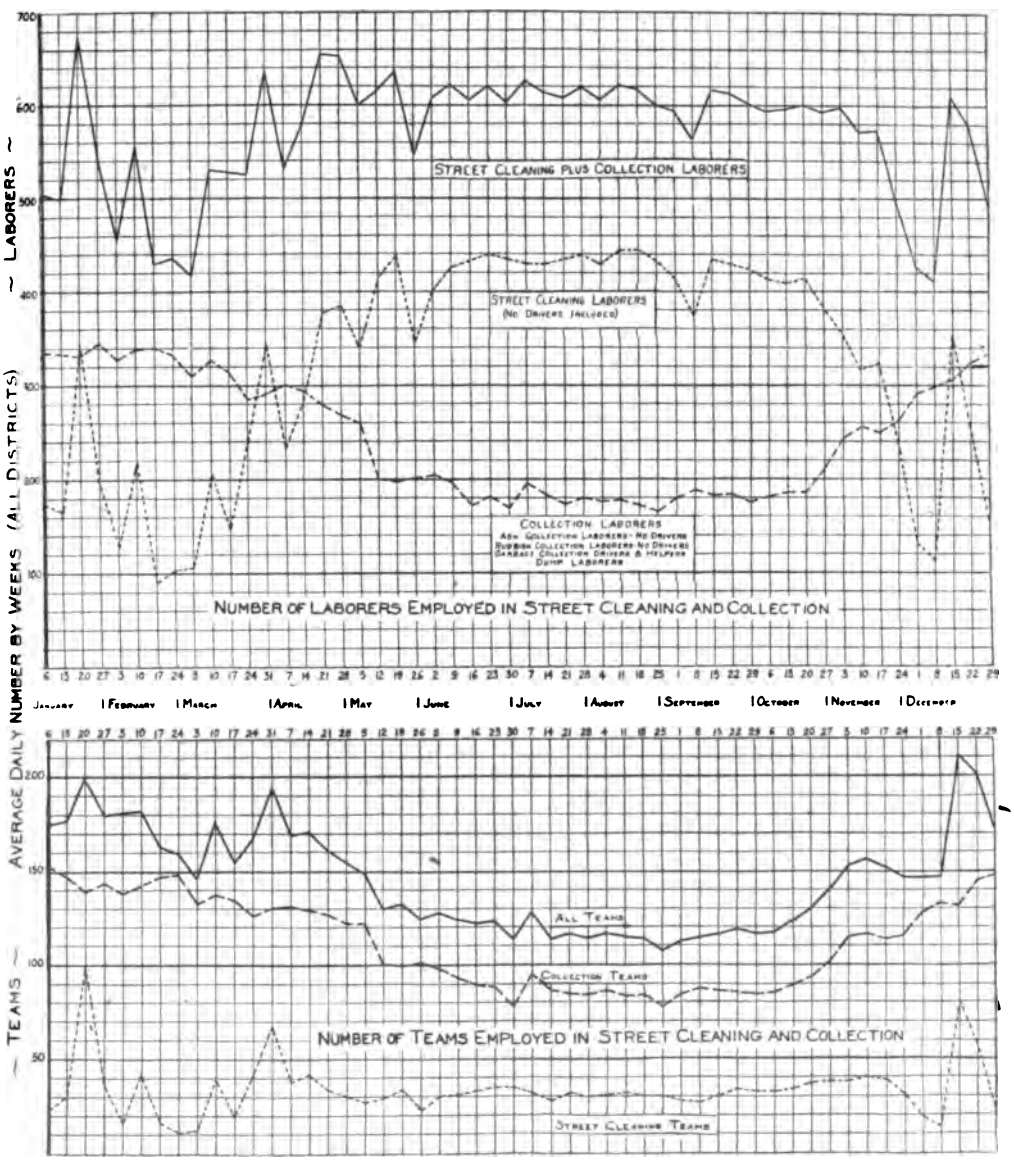
STABLES AND SHOP.

On January 1, 1917, the city purchased the stable and equipment of the Genesee Reduction Company. The equipment included 65 horses and mules and 38 wagons for use in collecting garbage. The teams were stabled in a wooden barn on the west bank of the Genesee river adjacent to the reduction plant. In the barn and adjoining sheds are carried on painting, repair work and horse shoeing. The force consists of three barn men, one night man, one blacksmith and one helper. The garbage collection drivers clean, brush and harness their own teams and feed them at noon, and the four stable men clean the stables and feed the teams morning and night. The blacksmith and helper do all the shoeing and wagon repair work, except the replacement of tires. One of the barn men does painting at odd hours. Small harness repair work is done by the barn men, the more extensive repairs being sent to regular harness makers. Veterinary attendance is obtained when needed.

The city now owns no horses and wagons except the 65 used in garbage collection. The rubbish wagons, which are built and repaired at the repair shop, are loaned to the team owners who collect the rubbish. It is recommended that the city purchase all of the teams needed for the work of the Street Cleaning Department, and provide sufficient stables for maintaining them. The substituting of motor trucks for teams was carefully considered, but it was thought improbable that such change would reduce the time and the cost of collection work, except perhaps in collecting ashes from large buildings where there are long hauls to the dumps. It is recommended therefore that 96 additional teams, harness and wagons be purchased and housed in three new stables located near the three work-centers of the city so that they would not need to travel unduly far before starting to work. Each stable should have a stable foreman, stablemen and hostlers. A veterinary surgeon on about three-fourths time could look after the health of all the horses. He should act also in an advisory capacity in connection with purchasing and condemning horses.

"The repair shop for repairing, making and storing the equipment of the Street and Sewer Bureau is a modern three-story brick building. The working floor space is approximately 56x128 feet, or 7,160 square feet, and there are two floors of the same size for storing the smaller equipment. (The elevator is not large enough to permit wagons, sweeping machines, etc., to be taken to the upper floors for storage, nor are the upper floors substantial enough to hold much heavy equipment.) The building is steam heated from a plant located in the basement of the Water Works repair shop adjoining.

"The machinery equipment consists of one 5 h. p., G. E. motor, which operates a wornout saw table, one boring machine, one hand saw in poor condition, one large grindstone, one emery wheel, and one doweling machine. This motor is not powerful enough for the work required of it. In addition there is a hand drill and a 10-



WEEKLY RECORDS OF NUMBERS OF LABORERS AND TEAMS USED IN STREET CLEANING AND COLLECTION DURING 1917.

h. p. motor which operates a planer. None of these machines is protected by guard rails or by other device for the safety of those working with and around them.

"There is no fire protection provided in the shop building, either in the shape of attached hose, fire extinguishers, or automatic sprinklers. The intermediate floors and the stored lumber and equipment are, for the most part, combustible, and there is danger of fire from the electric wiring, from sparks from the machines, and from smoking by the men.

"The working force of the shop consists of one foreman and five regular men, and is inadequate to cope with the growing requirements of the bureau which its serves, especially in the handling of quick repairs which frequently are needed to carry on the outside work to the best advantage. In name at least, the shop is a repair shop, but in fact a great deal of the time of the men is devoted to manufacturing street sweepers' push carts, box carts, barrel trucks, broom handles, sand boxes, wagon tongues, single and double trees, street barricades and large rubbish collection wagons. Repair work and painting are done on wagons, sweeping machines, sprinkling carts, sweepers' tubs, push carts, brooms, scrapers, shovels, hose reels, rubbish barrels and other miscellaneous equipment of the Street and Sewer Bureau. Practically all the iron work is done by the blacksmiths of the Water Works shops."

The needs of the shop include fire extinguishers on all floors, additional working and storage space, guard rails about the machinery, an increase to the labor force and, as additional equipment, a band saw, saw table, power drill, buzz planer, mortising machine and a 15 h. p. motor.

RECORDS.

The need for accurate working records and working data of various kinds apparently is not fully recognized at present. The forms in use by the street cleaning force are believed to be fairly satisfactory, but it is necessary that more care be taken to obtain accurate reports. This can be accomplished best by providing in each district a clerk and timekeeper to be responsible for the gathering and reporting of the various kinds of data required.

Accurate working data, charts and maps should be provided, so that the planning of work may be possible. At present there are no records in existence to aid in planning work, and if a foreman is transferred from one district to another, he has no information at hand as to his new work except the word of the laborers. The result of this frequently is a duplication of work of various kinds, such as sprinkling in conjunction with machine sweeping. The cost of obtaining accurate data and preparing the necessary maps and charts would be more than repaid by the economies and better service which would result from careful planning.

In addition to existing report forms, it is desired to develop more detailed forms for obtaining various kinds of cost data, particularly that necessary to compare the operation of the various types of equipment and work methods, as well as work of similar kinds done in the several districts. Provision should be made also for the preparation and issuance of an annual report by the Department of Public Works. Such a report, if properly prepared, should entail no large amount of work and would prove invaluable. In addition to these records it is necessary, for economy, that equipment be purchased according to a definite plan and from moneys provided therefor in the annual budget of the department. This means that there should be kept a running inventory of equipment and supplies. This inventory should be used in preparing the budget estimates each year.

STREET CLEANING AND REFUSE DISPOSAL IN SAVANNAH

Itemized and Unit Costs of Cleaning Different Kinds of Pavements—Destructor Expenditures and Credits—Oiling Catch Basins.

In his report for the year 1917, E. R. Conant, chief engineer of the City of Savannah, Ga., gives the following tabulated cost of cleaning streets in that city during the year:

Cost of Cleaning Streets in Savannah.

Class of Pavement	Area in Sq. Yds.	Percentage of Area Cleaned Times per Week 1	2	3	4	6	Length in Miles	Cost of Cleaning per year, including Removal of Debris	Cost per Mile per Year	Cost of Cleaning per 1,000 Sq. Yd. per Year	Cost per 1,000 Sq. Yd. per Cleaning	Cu. Yd. Debris Removed	Cost per Cu. Yd. Debris Removed.
Sheet asphalt	140,818					100	5.03	$8,295.00	$1,632.65	$60.74	$198	5,441	$1,528
Asphalt block	342,190		58	25	9	8	13.52	11,885.00	861.14	34.49	251	4,612	2,579
Granite block	122,108		100				6.10	6,843.00	1,121.81	55.74	560	3,000	2,281
Vitrified brick	384,849		71	9		20	16.49	15,913.00	960.03	41.09	283	6,507	2,430
Concrete	55,932		100				2.97	1,725.00	580.50	30.24	302	810	2,128
Cobble stone	68,224	100					3.74	863.00	220.63	12.64	632	424	2,034
Total	1,114,121	6.12	58.38	10.51	2.79	22.20	47.85	$45,524.00				20,794	

REFUSE COLLECTION AND DISPOSAL.

During the year 23,000 tons of garbage and 400 tons of ashes were collected, and 444 carcasses of cows, horses, sheep and hogs. The cost per ton averaged $2.50, including all labor, care and renewal of live stock and upkeep of equipment. The carcasses were delivered to a rendering plant and $150 obtained for them. Street sweepings from the city lots amounted to about 1,200 tons and were sold at the lots for $325.

The destructor plant was operated uninterruptedly during the year and burned 23,400 tons. The cost of operation was $18,518, in addition to $1,502 for clinker disposal, $1,538 for weighing refuse and delivering it to the hoppers, and $3,246 for maintenance of plant. This total of $24,804 was partly offset by steam generated by the heat of the incinerator and furnished to the water works pumping plant that effected a saving of fuel of $8,379, making the net cost for refuse disposal $16,425, or 70 cents per ton.

The destructor plant went into use in March, 1914. During the 3 yrs. and 9 ms. of operation up to the time

of making this report the total expenditures and credits were as follows:

Expenditures and Credits of Destructor Plant for Three Years and Nine Months.

Operation.

Labor	$61,506	
Material	6,011	
		$67,517

Maintenance.

Labor	$1,200	
Material and repairs, including labor and material	7,967	9,167
Outlays	$2,596	
Clinker disposal	5,091	
Weighing of refuse	3,199	
Handling cinders for fuel during July and August each year	1,900	
Fuel purchased	500	
	$13,286	
Grand total		$89,970

Summary of Credit.

Steam	$25,524
Clinker	4,963
Outlays that should be distributed over several years	2,596
Material on hand	3,000
Total	$36,083

The total amount destroyed for three years and nine months was 98,717 tons, equivalent to 72.6 tons per day. The net cost per ton was 54.6 cents, the guaranteed net cost of operation, assuming that the plant is worked to its full capacity of 130 tons per day, is 40.4 cents, and if the plant was worked to its full capacity, the net cost per ton would be less than the guaranteed cost. The cost above, however, does not include interest on investment or depreciation.

The average monthly amounts of garbage, rubbish and other refuse destroyed were, for the several years, as follows: 1914, 2,218 tons; 1915, 2,305 tons; 1916, 2,203 tons; 1917, 1,950 tons. The records for 1916 and 1917 reflect household economy under war conditions. The capacity of the plant is 3,900 tons a month.

OILING AND CLEANING CATCH BASINS.

Between April and November, during the mosquito breeding season, a force makes regular weekly inspections of all catch basins and the catch basins are treated with a low grade of kerosene or crude oil. This treatment eliminates to a very large extent the mosquito nuisance. The amount expended during the fiscal year for this purpose was $1,615. The number of oilings made was 54,000, making the cost for oiling approximately 3 cents. The number of catch basins was 1,774, or the cost per catch basin for the period when it was treated was a little less than $1.00 per catch basin, which must be considered a most economical expenditure for the results attained.

The cost of cleaning catch basins, including the removal of debris taken from same, for the fiscal year was $6,759, the approximated yardage removed from the catch basins was 3,540 and the cost per cubic yard was $1.90. The number of cleanings made during the year was 21,698. The cost per catch basin cleaned was 31 cents. The number of catch basins existing at the end of the year was 1,774.

USE OF CRUSHED STONE.

Road building and concrete demand large amounts of crushed stone—how large probably few have any idea. The U. S. Geological Survey gives out this month figures for 1917 showing the sales of this material in the United States during that year. The total amount was more than 40 million tons, valued at more than $29,000,000. Of this total, 66 per cent was limestone, 20 per cent was basalt and related rocks (trap rock), nearly 8 per cent was granite, nearly 4 per cent sandstone, and the remainder was of miscellaneous rocks. Crushed stone represented 48 per cent of all the stone quarried for all purposes. Owing to labor difficulties and embargoes, the amount in 1917 was 16 per cent less than in 1916.

Of the 1917 total, 37½ per cent was for roads, 23 1-3 per cent was for railroad ballast, and 41 1-6 per cent was for concrete. The highest price was paid for concrete stone, an average of 78c a ton; 75c was paid for road metal, and 56c for railroad ballast.

For road metal, limestone was used for 61 per cent of the amount, trap rock for 25 per cent, granite for 7¾ per cent, and sandstone and miscellaneous for the remainder. For railroad ballast, limestone was used for 76 per cent, trap for 12 per cent, granite for 5½ per cent, and other materials for the remainder. For concrete, limestone was used for 65 per cent, trap for 20 per cent, granite for 8½ per cent, sandstone for 5 per cent, and the remainder miscellaneous. The average price received for sandstone was 92c per ton, for granite, 88c, for trap, 82c, and for limestone, 66c.

Ohio used more crushed stone for road metal than any other state—1,869,282 short tons; also more for railroad ballast—1,053,710. But for concrete, Illinois led with 2,626,922 tons; New York being second with 1,964,264 tons. (Probably the use in the cities of Chicago and New York accounted for this). California was third in the amount of concrete stone used, Ohio fourth and Pennsylvania fifth. In stone used for road metal, New York was second, Illinois third, Indiana fourth, California fifth and Pennsylvania sixth. These six used a little more than all the remainder of the states combined.

NATIONAL WASTE RECLAMATION

Promotion Work to Be Taken Over by Department of Commerce as a Permanent Waste Reclamation Service—Value of Materials Reclaimable.

We have, in previous issues, referred to the work begun by the War Prison Labor and National Waste Reclamation Section of the War Industries Board with a view to salvaging materials needed by the Government in the prosecution of the war. Announcement was made on January 6 that this work is to be taken over at once by the Department of Commerce and expanded into a permanent waste reclamation service. In making this announcement the department reports that "at the time the armistice was signed the waste reclamation work had been organized by this department to such an extent throughout the country that the total value of the waste material then being reclaimed amounted to $1,500,000,000 a year. With the expansion in the work that is expected to come under the plans which Mr. Frayne has laid before Secretary Redfield, of the Department of Commerce, for more complete organization, it is estimated that an additional $300,000,000 a year may be added to the annual value of the waste materials salvaged. In further evidence of the need for such work it can be stated that many of the weapons with which the American forces hacked and blasted their way through the German lines were made from materials which came from dump and scrap throughout the United States.

"At the time the armistice was signed, local reclamation councils had been formed in eight-six cities of the country, and two hundred others were in process of formation, destined to make an endless chain involving the assistance of civic and fraternal organizations as well as school children. Many cities went to the extent of or-

ganizing, and many are planning to organize, permanent municipal bureaus to collect and reclaim all waste materials just as garbage and ashes are collected.

"This tremendous network of organization it is proposed to have the section continue to use after it has been taken over by the Department of Commerce, with the idea in view always of extending the work to the end of conserving materials for peace-time industries. Practically the entire personnel of the section will be taken over in order that there may be no interruption in the policy laid down for the work under way. J. D. Jones, now executive secretary, will be chief of the section. Mr. Frayne will continue his connection in an advisory capacity. From every part of the country have come demands that the waste reclamation work be continued, men in all industries being especially enthusiastic over the possibilities for the future.

"The Waste Trade Board, estimating the values of the waste materials reclaimed during the year by principal items, has compiled the following summary:

Scrap iron	$600,000,000
Scrap metal	300,000,000
Old waste paper and other rags	200,000,000
Woolen rags	75,000,000
Cotton and wool waste	100,000,000
Old rubber	300,000,000
Second-hand bags	25,000,000
Cotton linters	50,000,000

"As an illustration to show what can be accomplished through a well-regulated system of waste reclamation, the Reclamation Division of the Quartermaster's Department of the Army during the period from January 1, 1918 under this plan reclaimed 17,789,592 articles valued at over $20,000,000.

"It is expected that the reproduction of raw and waste products from waste materials will in the future play an important part in the development of American export trade, offering American producers and commercial interests a better competitive chance with foreign rivals without in any way affecting or changing labor conditions by lowering the standards of the workers.

"The extent to which the habit of waste had seized upon American industry before the war is illustrated by the experience which followed the organization by the War Prison Labor and National Waste Reclamation Section, Labor Division of the War Industries Board of a local reclamation council in a small city in Pennsylvania. Within a week after the council was organized approximately eighty tons of waste book stock paper was salvaged in that small community, and one of the local banks had returned to a nearby mill twenty-five tons of old books and waste paper that had accumulated in the course of a single year. One result of the waste paper reclamation work was to raise the price of this waste material to the householder and to create a live market for it.

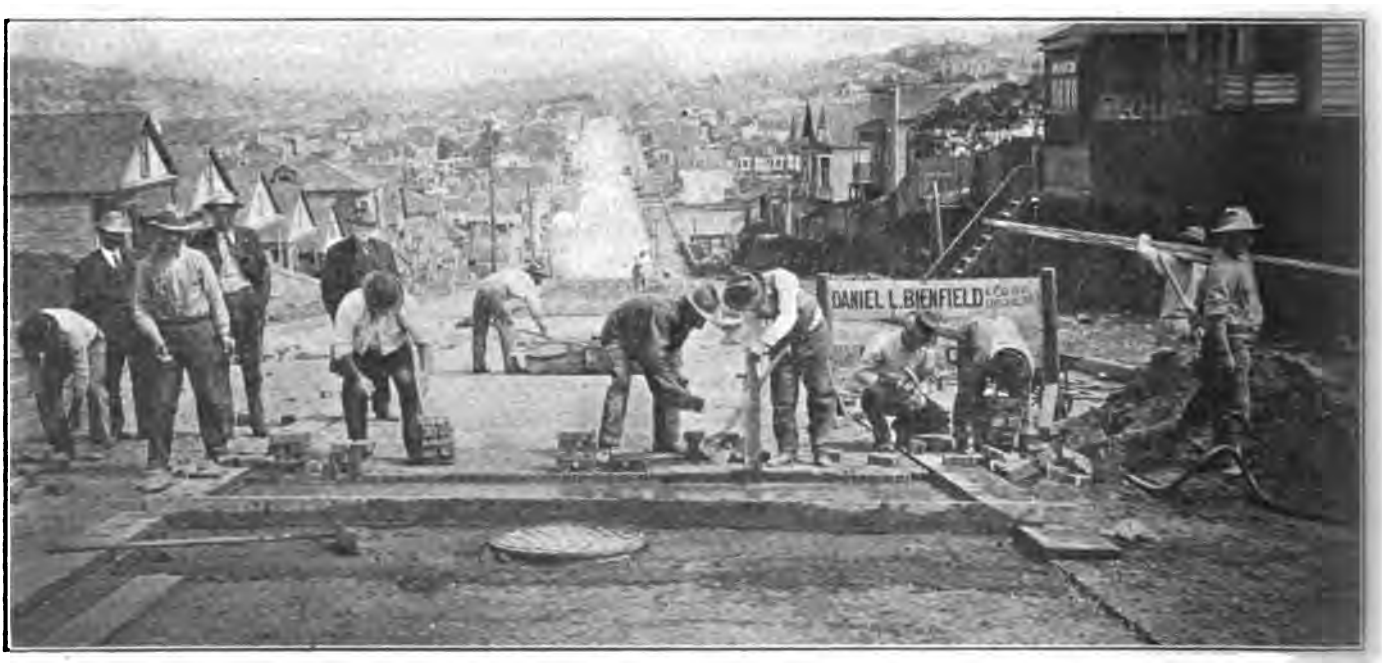
"Before it was determined to transfer the Section to the Department of Commerce as a permanent agency of that department, a canvass of heads of departments and of leaders in industry and labor brought forth unanimous indorsement of the suggestion that the work be continued."

PORTSMOUTH WATER WORKS.

The water works of Portsmouth, Va., from the point of view of the fire protection afforded, were examined and reported upon last month by the National Board of Fire Underwriters. The inspecting engineers reported that few improvements had been made for several years past because of the prospect that the city would purchase the plant. Bonds for this purpose were sold last November, and the city was expecting to take over the plant this month.

Because of the many government projects in and near Portsmouth, the consumption has more than doubled recently, the average being about seven million gallons. The U. S. Housing Corporation has laid some large mains in connection with supplying the section near the Navy Yard, but this has not helped the city's distribution system, and the pressure in the city frequently falls to twelve pounds and occasionally to seven pounds.

To meet the additional demands, the Federal government has authorized the expenditure of over one million dollars for improvements described in our issue of November 16. In addition to these, 2,200 feet of 24-inch cast iron pipe will be laid through the Portsmouth distribution system. About 8,000 meters are being installed to cut down the present high consumption rate. Improvements in conditions in the pumping station buildings are reported necessary.



LAYING A CENTER STRIP OF BRICK WITH ASPHALT ALONG THE SIDES ON A STEEP GRADE
The base along the sides is higher than in the center strip, to provide for the thiner asphalt.

STREET PAVING IN SAN FRANCISCO.*

Where Brick Pavements Are Used and How Laid—Use of Asphalt Pavements—Asphalt Repairs—Rock Asphalt.

BRICK PAVEMENTS.

All streets having more than six per cent grade in the heavy hauling district and more than eight per cent grade in the residential districts are paved with either brick or basalt blocks, an ordinance limiting asphalt pavements to these grades. However, asphalt may be used for grades up to eighteen per cent if strips on the sides or down the center of the street are laid with brick or basalt. In a number of streets the central strip of asphalt is used, giving a straight away course for automobiles, while brick side strips give a foothold for horses and are used by other more slowly moving traffic. The center strip is always made 14 feet wide.

About two years ago San Francisco began laying vertical fibre brick pavements of the so-called monolithic type on light traffic and residential streets, to replace old cobblestone pavements.

The base for brick pavement is in general at least six inches thick, but when laid on a grade exceeding six per cent the thickness may be reduced to four inches. For the thin base the specifications for the size of broken stone are particularly rigid. A one and one-half-inch sand cushion is used. The specifications use for construction are practically those of the American Society for Municipal Improvements.

Bricks used for grades exceeding six per cent are required to be rough and irregular on the exposed surface, or else hillside bricks are used.

Along the street car tracks the space between the web of the rail and the bricks is filled with cement mortar, consisting of two parts sand to one part Portland cement, and this mortar is required to be in the proper condition and the edge constructed to a straight line before the bricks are laid. The bricks are so laid that, when rolled, the surface of the pavement will be ¼-inch below the top of the rail.

After being set, each row of bricks is jarred or driven together end on, so as to make the smallest possible end joint; and the rows are barred or driven together side wise to a straight line after every fifth course.

An expansion joint is provided along each curb, space for it being secured by placing two beveled boards face-to-face along the curb before the brick are laid. After the brick have been laid the boards are removed and the space immediately filled with a composition of one part melted asphalt and three parts limestone dust, the asphalt having a penetration of 40 degrees to 60 degrees, District of Columbia standard. The joints are filled with cement grout.

Cost of Paving. As an illustration of the cost of brick

Cost of Brick Paving on Webster Street.

Curb (relining)—labor and teams		$100.70
Grading—labor and teams		1,251.13
Concrete:		
Labor and teams	$1,115.01	
Cement, 1,297 sacks	648.50	
Crusher rock, 8 yds. @ $1.00	8.00	
Purchased rock, 292 yds. @$1.25	365.00	
Sand, 92 yds	92.00	
		$2,228.51
Brick—22,360 sq. ft.:		
Labor and teams	$635.50	
Labor and teams—sand	45.50	
Labor and teams—brick	641.62	
Cement—399 sacks	199.50	
Sand—24 yards	12.00	
Brick—114,000 @ $25.50	2,907.00	$4,441.12
Total, not including curb		$7,920.76
Unit cost		$0.354

* Continued from page 3.

LAYING BRICK IN CENTER. ASPHALT SIDE STRIPS ALREADY LAID.

pavement in San Francisco the itemized cost of a paving job on Webster street is given on the preceding page.

ASPHALT PAVEMENTS.

The use of sheet asphalt pavements is increasing in San Francisco, chiefly because of their low cost of construction and suitability to conditions. Topeka pavement also has been increasing in use, this pavement being found particularly suitable to streets that have a gradient in excess of that on which ordinary sheet asphalt can be used but on which a comparatively smooth pavement is required. It is used quite generally on residential streets of medium grade. It is especially valued by automobilists for its non-skid properties. The experience of the street paving department leads it to believe that the successful pavement of the future will be of less thickness than formerly and will possess greater non-skid properties, since 90 per cent of the traffic is now rubber-tired.

The city is greatly reducing the skid property of sheet asphalt by scattering No. 3 crushed stone on the asphalt immediately after it has been spread and rolling it with a hand roller, which forces the stone into the asphalt, but leaves the surface of it flush with the asphalt surface. The fine stone in the asphalt is raked out before the broken stone is applied. About six wheelbarrows full of stone are applied to an area of 700 square feet, being scattered so that there will not be three or four pieces of stone grouped in one place, which would result in their working loose and leaving a hole in the surface.

Repairing. For repairing the asphalt, three Lutz resurfacing machines are leased, two being in constant operation and the third held in reserve. The two resurfacing machines and the steam roller are operated by a crew consisting of three engineers and seventeen men. The resurfacing heaters burn oil, each using about five barrels daily, and an oil tank accompanies them. The asphalt used for replacing the old asphalt that is raked off or for filling in depressions is prepared at the municipal asphalt plant and is hauled to the streets by two motor trucks of four and five cubic yards capacity respectively. In this class of work the crew operates on one or two blocks at a time, working down one side of the street and back the other, thereby keeping one-half of the street open to traffic all the time.

The municipal asphalt plant is reported to have saved the city a considerable amount in repairing and maintaining asphalt streets. It is operated by twelve men and has, when rushed, manufactured 3,000 cubic feet of asphalt daily.

APPLYING SAND TO COMPLETED PAVEMENT.

The cost of surface heater repairing in 1916-1917 was as follows, 1,522,792 sq. ft. of such work being done:

Labor	$22,865.30
Teams	10,462.50
Oils and greases	92.25
Binder, 132.3 tons; asphalt, 8,980.0 tons—9,112.3 tons @ $3.56	32,439.75
Rock, 914 cu. yds. @ $1.25	1,142.50
Fuel oil, 1863.5 bbl. @ 90c	1,677.15
Royalty @ 5c per sq. yd	8,460.00
Total cost	$77,139.45
Unit cost per sq. ft	$0.0507

The city requires all asphalt cement to be prepared from California products, either natural asphalt, a mixture of refined liquid asphalt with a solid asphalt, or an oil asphalt. The consistency of the cement must fall within the limits of 65° and 80° penetration.

Rock Asphalt. As a large amount of bituminous rock is available in California, the city uses this extensively in paving. Two inches of rock asphalt on a six-inch concrete base is the standard. The bituminous rock is reduced to a fine disintegrated condition by the action of heated, dry air and when so reduced and while having a temperature of not less than 200 nor more than 300 degrees, it is spread and rolled with hot hand rollers weighing not less than 250 pounds per foot width until the surface is thoroughly compacted. Following this, it is rolled with a steam roller weighing not less than 150 pounds per inch width, this roller being used for at least five hours for each thousand square yards of surface.

ASPHALT WEARING SURFACE, JUNIPERO STREET, SAN FRANCISCO.

SPRAYING MIXTURE OF DISTILLATE AND ASPHALT ON CONCRETE BASE AS BINDER FOR TOPEKA SURFACE.

The bituminous rock is required to be of such quality as to yield not less than nine nor more than fifteen per cent of bitumen when extracted by carbon bi-sulphide, and to contain not more than two per cent of non-bituminous, combustible material. The sand in the asphalt must be clean, hard and moderately sharp and must all pass a screen having eight meshes to an inch; while at least fifteen per cent of the non-bituminous matter must pass a hundred-mesh screen and at least sixteen per cent must be retained on a fifty-mesh screen. In case the natural bituminous rock deposit does not afford material complying with the above requirements, a mixing of several grades of bituminous rock or the addition of the lacking ingredients under suitable manipulation is permitted.

WATERWORKS OPERATION: RESERVOIR MAINTENANCE.

Preventing Pollution of the Reservoir from the Catchment Area—Preventing Erosion—Objectionable Features of Swamps.

The catchment area of a reservoir should be kept free from conditions or acts that would tend to pollute the water supply by preventing either soil or pathogenic bacteria or any other polluting matters from being washed into it. It is also desirable to maintain on the catchment area (and at several points on such area, if it be a large one) rain gauges, to be used in studying the run-off to determine the limit of the yield which can be relied upon.

The keeping of the rain-fall records would require a daily visit to the gauges. The maintenance of sanitary conditions requires more or less frequent visits to all parts of the catchment area, the frequency depending upon the possibilities of contamination. Where there are dwellings, barnyards, outhouses or other features of permanent occupation that might cause pollution of the water supply, the visits should be sufficiently frequent to insure that the conditions and practices which are required of the occupants are lived up to by them. On unoccupied portions precautions must be taken against pollution by campers, picnic parties, unconfined cattle, etc.

Pollution. Where the entire catchment area is owned by the city or water company, the enforcement of proper regulations upon any occupants or abutting owners is generally not difficult, although it will frequently require the construction and maintenance of proper fencing around the property. Where there are private properties on the catchment area the occupants of these can be kept under more or less perfect control by recourse to state laws or state board of health regulations in most states. It is generally preferable, however, where it is possible to do so, to use persuasion and retain the good will of such occupants rather than to resort to law, both because it is generally cheaper in the long run, and especially because it is almost impossible to maintain such careful watch as to prevent any infraction of the law where the parties entertain a grudge against the company.

In most states where the company or city is given power by law to prevent pollution of the water flowing to the reservoir it is generally required that any expense necessary for effecting this, other than that required for living up to ordinary sanitary regulations, must be at the expense of the city or company. In some cases it is preferable, as suggested above, to undertake certain improvements without expense to the property owner, even where he might legally be required to provide the improvements himself. For instance, in the protection of the Esopus watershed of New York City's Catskill water supply the city, in order to secure proper sanitary conditions around the farm houses and other dwellings on the catchment area, built more than one hundred sanitary privies of a standard design and erected these where needed at the cost of the city, the cost being about $17 each, exclusive of hauling the material to the site and erecting it. In some cases where there are villages on the area the city has constructed an entire sewerage system and led the sewage to an outlet below the reservoir. Barnyards, pig sties, etc., should not be permitted near streams that feed the reservoir and there should be

TOPEKA WEARING SURFACE IN STREET LEADING TO CITY HALL.

provisions made that will prevent any matter therefrom being washed into the stream by the run-off of rain storms.

In some cases where it seemed impracticable to provide a sewer system, or where the expense of doing so was greater than could be afforded, the stream receiving the impurities from residences, barnyards, etc., has been purified below the sources of such pollution, this treatment including generally disinfecting, as well as removing suspended matters. Frequently the latter can be secured by building a small dam across the stream sufficient to provide a sedimentation basin in which the solids may collect, thus clarifying the water, which can then be treated with a sterilizing agent, liquid chlorine being that commonly employed. There is danger, however, that freshets will wash the suspended matter from such sedimentation basin on into the reservoir, or will send down more water than can properly be disinfected, and a much safer course is to prevent dangerous pollution from reaching the stream at all. Moreover, where there is a treatment of this kind it generally requires for its safe operation the continual presence of an operator, or at least frequent visits from some one competent to judge whether it is giving satisfactory results. However, it may be cheaper to operate one or two purification plants of this kind treating a small part of the run-off than to treat the entire supply as it leaves the reservoir.

Erosion. The washing of soil into the reservoir is objectionable, both because it muddies the water and forms deposits in the reservoir and also because it removes from the catchment area the soil necessary to support vegetation. Both the top soil and the vegetation are desirable for several reasons, one being that they provide a sub-surface storage, which diminishes the run-off from storms, thus increasing the percentage of such run-off that can be utilized. Another is that if the vegetation disappears, erosion continues with greater and greater intensity unless bedrock is at or near the surface. The advantage of trees on a catchment area in moderating the violence of winds that increase evaporation and in keeping the water cool has already been referred to.

The best method of preventing erosion in most cases, where the slopes are not too steep, is by keeping the area continually planted to trees, grass or crops. Where gullies have already been formed or the slopes are quite steep, other methods may be necessary. For slopes an excellent plan is to throw up water breaks at intervals of five or six feet, measured vertically, each water break following quite closely a surface contour. Such breaks can be turned up by a plow or cast up by shovel. These retard the velocity of flow of the run-off, causing it to start at practically zero as it overtops each of the breaks or banks. Eroded soil will collect behind these in time, and it will probably be necessary to raise the water breaks at intervals. However, a better plan, if practicable, is to plant the more or less level ground above the water breaks, when the soil has collected there, with grass or other vegetation that will prevent erosion.

Where the water has cut gullies in the soil, water breaks can be made higher, even possibly five or six feet. Since, however, water permitted to flow over these dams would undoubtedly wash out the soil at the bottom, it is desirable to provide overflows by placing in the bottom of the gully, before building the dam, drain tile or sewer pipe of sufficient size to carry the storm flow in such gully, the upper end of such pipe being continued with a bend and a length or two of pipe set vertically so that water will stand behind the dam to a height a little below its top before overflowing into the next basin, thus permitting the water to deposit any soil carried in suspension.

Swamps. Another common cause of undesirable condition in the water is the presence of swamps on the catchment area. Water from swamps is generally unattractive in color, sometimes being a very dark brown. It may have objectionable taste and even odor owing to the dissolved organic matter that it contains, and this matter, when carried into the reservoir, may furnish food for the growth of algae, plankton and other organisms. Also water standing in swamps may furnish an excellent breeding place for mosquitoes. Another objection to swamps is that the yield of the swampy part of a catchment area is generally less, and sometimes considerably less, than that of the dry portions, chiefly because the swamp holds the water spread over a large area and heated by the sun, thus affording opportunity for a considerable loss by evaporation.

These objectionable features can generally be overcome to a large extent by the construction of drains. In improving one of the catchment areas of the Metropolitan (Boston) waterworks, in the case of long and narrow swamps, a ditch was located along that side of the swamp at which the larger part of the yield was received, this ditch being made deep enough to drain the swamp and any water courses in the swamp being connected to it. In the case of larger swamps, drains were constructed entirely around the edge of the swamp and water courses were connected to it or branch drains run into the swamp. The ditches used here were constructed with side slopes of two to one, the bottom being formed of a board twelve inches wide resting on mud sills two inches by four inches by two feet, spaced three feet apart. Along each edge of the board was fastened a triangular strip, formed by sawing a 4 x 4 in two diagonally, this strip being used to support the paving on the side slopes. This paving consisted of stones, laid by hand and carried up to a level slightly above that of the normal water surface, the paving being carried to the top of the slopes at turns and junctions. As the boards were continually under water they did not rot. Any trees present were removed for a width of twenty feet on each side of the ditch to keep out falling leaves. The ditches were made 1½ to 3 feet deep, the excavated material being spread along the side of the ditch, with breaks at intervals to allow the water to flow off. These ditches cost from 25 to 50 cents a foot, with labor receiving from $1.50 to $2 a day. The aim was to give a velocity of flow of about two feet per second, and a fall of about one in a thousand was provided in most cases. The maintenance force went over these ditches twice a year with a square-pointed shovel, thus removing any soil or other material which was thrown up on the bank. The maintenance cost about $25 a year for 25,000 feet of ditch. Most of these ditches were constructed on private land, but the owners readily gave their consent, as in many cases the ditches made it possible to cultivate the land which had previously been swampy.

A considerable number of instances are on record where a water supply has been rendered very unattractive and has even been suspected of causing sickness because of the presence of large or numerous swamps on the catchment area, which conditions have been greatly diminished or entirely removed by proper drainage.

Forestry. The raising of trees on catchment areas both affords the advantages already referred to and may be used as a means of profit through the sale of the timber. Moreover, a number of cities have found it good policy to permit the reservoir and its immediate surroundings, and possibly the entire catchment area, to be used as a place for pleasure and recreation by the citizens, and the presence of trees assists greatly in this. This will be discussed in the next instalment.

Municipal Journal

Published weekly at
243 West 39th Street, New York, N. Y.
by
Municipal Journal and Engineer, Inc.

S. W. HUME, *President*
J. T. MORRIS, *Treasurer* A. PRESCOTT FOLWELL, *Secretary*

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago

Contributed Articles and Reports

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

WHAT IS A STREET?

Probably few if any readers of this paper would have any hesitation in agreeing that a street is a public way for traffic passing in front of building sites (to distinguish it from a country highway, which does not pass in front of building sites), and that the term includes gutters and sidewalks as well as roadway. The term is so used by Nelson P. Lewis, I. O. Baker, Austin T. Byrne, Arthur H. Blanchard (these names are taken at random) and every other American engineer who has written concerning streets, so far as the writer is aware; and by the writers on city planning also. When we speak of "Main Street" we mean both sidewalks and roadway, from property line to property line, and not merely the roadway. A country "road" has no sidewalks, properly speaking, but vehicles may travel over any part of it, although the grading and surfacing is generally confined to a part of the width only as a matter of economy. When sidewalks are defined and constructed we call the highway a "street," and vehicles are confined to a definite width, corresponding in this respect to the entire width of the country "road," and this vehicular space is then properly called the "roadway" part of the street.

Considered from a legal point of view, we find in McQuillin's "Treatise on the Law of Municipal Ordinances" the following definition: "'Street' is a generic term, and includes all urban ways which can be, and are, generally used for the ordinary purposes of travel. Street, in a legal sense, usually includes all parts of the way—the roadway, the gutters and the sidewalk."

The reason for explaining at length what it might be supposed all would accept as established usage and undisputed, is that the chairman of the National Highways Transport Committee, William P. Eno, in offering for universal adoption a set of "General Highway Traffic Regulations," defines street as "that part of a highway intended for vehicles"—what is commonly known by municipal engineers as the roadway. It may be that he does not propose this definition of the term for general use, but only for the purpose of these regulations (as a boy roller-skating in the roadway answers to the definitions of "vehicle," "driver" and "horse"); but we can conceive of no reason why "roadway" would not serve his purpose equally as well, and its use would avoid violation of precedent and of the practice of those who use highway terms with discrimination and understanding.

In our opinion it would be very unfortunate and confusing to the public if an effort should be made to secure the use, in traffic regulations, of a meaning of this word that has not been and certainly will not be accepted by engineers, city planners, and others who deal professionally with the planning, constructing and maintaining of "streets."

SOLDIERS' MEMORIALS.

What form of memorial shall we adopt to commemorate the participation of our soldiers in the World War, our pride in them and our mourning for those who will not return? This is a question that is being asked in villages, cities and state capitals throughout the land.

The stone or iron "soldiers' monuments" that were erected after the civil war are no longer considered the only appropriate form; instead, we find memorial roads, trees, parks, buildings, hospitals and other ideas proposed, most of them embodying the idea of serving some useful purpose. Toledo and Catasauqua, Pa., are illustrations of a large city and a small one which have adopted the idea of memorial buildings, the former proposing to raise the necessary funds partly by appropriation and partly by private contributions, the latter wholly by popular subscription. The Catasauqua building is to include a room in which will be placed war records and trophies and a roster of the city's soldier sons, as well as an auditorium and other features suitable for making it a center of community life.

There also would seem to be special appropriateness in hospital buildings; while for a small community a park with a rest house in which a commemorative tablet would be placed has much to commend it. It has been suggested also that a tree be planted or assigned for each soldier given by the community, either along a "memorial road" or in a park. The idea of a memorial road is suggested by the Lincoln Highway, and would seem to be especially suitable as a county or state memorial for those who went from farms and settlements too small to be able to provide local memorials.

Whatever the form adopted, let us hope that competent advice will be taken in the designing. The crudities in the way of statuary that were sold by the ton to many cities after the Civil War will not, we believe, be duplicated in the twentieth century; but it is none too certain that some memorial committees will not repeat the effort to get the maximum size obtainable for the funds available. Mere bigness is never artistic, nor is it often impressive in the way that a memorial should be impressive. If a road is built, let it be of the most durable pavement laid in the best manner, and in the most effective location. If a building, the aim should be to make it impressive by its architectural beauty and simplicity rather than by size or ornateness.

A matter that should not be overlooked is the maintenance of the memorial. A road, a building or a park that has fallen into disrepair is a disgrace to the municipality that built it; and where it is a memorial, it suggests that what it was intended to commemorate has been forgotten. Maintenance requires funds, and the providing of these should not be left to chance or an afterthought, but should be made a part of the plans adopted at the outset.

The WEEK'S NEWS

Record Highway Proposals Throughout Nation—Philadelphia's Water Finances—Secretary Daniels Threatens Philadelphia with Vice Ban—Cleveland's "Striking" Firemen Answer Alarm—New York State's Constitutional Amendments Were Approved—Assessing Uncompleted Buildings in New York City—Six-Cent Fare Denied in Detroit—Finances of Boston Elevated Under Trustees—Cedar Rapids Voters Approve Higher Fare.

ROADS AND PAVEMENTS

The Country's 1919 Highway Plans.

Washington, D. C.—The Division of Public Works and Construction Development, which has just been organized by the Department of Labor, has obtained from the Bureau of Public Roads and Rural Engineering of the Department of Agriculture a compilation of estimates of the amount of road work to be undertaken in several states during 1919. These indicate about $300,000,000 of construction for the country. Cash expenditures from all sources on highways for 1916 were, according to the official reports to the Department of Commerce, $272,634,424. Figures for 1917 are not yet available, but, in view of the restrictions placed on the movement of material and on the construction of roads generally, except where they were needed for war purposes, it is probable that they were much less. The definite estimates so far obtained by the Department of Agriculture indicate the following expenditures for roads this season: Maine, $1,500,000; Rhode Island, $90,000; Connecticut, $4,000,000; New York, $12,000,000; New Hampshire, $175,000; Kentucky, $1,500,000; Alabama, $1,000,000; West Virginia, $16,000,000; Illinois, $9,000,000; Iowa, $15,574,000; Louisiana, $4,674,000; Texas, $20,000,000; Nebraska, $1,657,089.07; North Dakota, $3,000,000; Wyoming, $653,000; Colorado, $3,900,000; California, $20,000,000; Arizona, $900,000; Nevada, $1,148,849.80; Idaho, $1,000,000.

Federal Road Legislation Plans.

Washington, D. C.—Senator John H. Bankhead, chairman of the Committee on Post Offices and Post Roads, to which all highway legislation in the upper branch of Congress is referred, in commenting upon bills now pending, recently made this plea for road construction: "The war showed what the national strength could accomplish in the swift construction of rapid transit highways and the use thereon of rapid transit vehicles. The nation trained its engineer corps and sent them to Europe equipped for the quick construction of roads. The part which the United States took in the decisive campaign was rendered possible by the use of automobiles and motor trucks over rapid transit highways. Now that the war is over the question arises, Are not highways as vitally important for the conduct of peace as they were for the conduct of war? With half the world going to bed hungry every night and millions doomed to starvation, is not the swift construction of the highway to the acre that produces as urgent a necessity as were the roads in the battle zone? And if the need is as urgent, should the nation slacken its effort or permit its road building equipment to be sold or dissipated? Should it not rather increase its efforts in this direction and proceed with the construction of highways at home on a scale commensurate with the importance and urgency of the need? It is for the Congress of the United States to answer these questions. Measures are pending designed to meet the situation, three of which are as follows:

"(1) Joint resolution 200, authorizing the transfer from the War Department to the Department of Agriculture of all available dispensable and suitable war material for distribution to the highway departments of the several states for use on the highways.

"(2) Senate bill 5088, increasing the present unexpended appropriation of about $60,000,000 for road purposes by the addition of $125,000,000 for expenditures to June, 1920, and $100,000,000 a year thereafter for four years. It is also proposed to increase the appropriation for national forest roads of $1,000,000 a year on the present ten-year road building program by a sum sufficient to construct 17,000 miles of forest roads, which the Government has already planned and which are necessary in order to utilize the vast resources of the national forests. The estimated cost of these roads is $50,000,000. Amendments to the present road act, freeing it from undesirable limitations, are also planned, one of which will enable the Government to construct at its own cost links in important highways which could not otherwise be constructed.

"(3) House bill 13308 carries an appropriation of $1,000,000 for an extension of the motor-truck parcel-post service. This is an increase from the $300,000 provided in the last Post Office Appropriation Bill, which also authorized the War Department to transfer to the Post Office Department motor trucks for which it had no further use. Under last year's appropriation twenty-seven motor-truck routes were established, all but one of which were operated east of the Mississippi River.

"The results, even in the initial stage, are such as to warrant an increase in the number of routes and their extension to the trans-Mississippi region, where rail and water facilities of transportation are altogether inadequate. The proposed transfer of 10,000 motor trucks from the War Department to the Post Office Department renders it possible to make a great extension of this service at a minimum cost. It is proposed to increase the appropriation for this service to $10,000,000. To store these trucks would cost $600,000 a year. To dump them on the market would be disastrous. To turn them loose to aid agriculture in the movement of farm products to the consumer would be statesmanship. To adopt such a policy would be but to follow historic precedent.

"Senate bill 5088 has the approval of President Wilson and Secretaries Houston and Baker. The proposition not to lessen the national endeavor in road construction now that peace has come, but merely to transfer the scene of action from Europe to the home land, is but the response to a universal demand. The public rejoices to see the trophies of war now being brought back from Europe. Equally popular will be the sight of machines that built the United States road to the Rhine at work building connecting highways from Canada to the southern boundary and from the Atlantic to the Pacific through every state in the Union."

WATER SUPPLY

Meter Receipts Show Rates Fair.

Philadelphia, Pa.—A falling off of about $250,000 in water rent collections during last year, it is explained by Carleton E. Davis, chief of the bureau of water, has been anticipated by the municipal officials. The receipts indicated, so he declares, that the returns from metered properties were satisfactory and that the rate now in force is fair to both the consumer and the city. "No attempt should be made," the chief continued, "to compare the receipts of the year with those of another until the nature of the receipts serving as a standard of comparison is known. The receipts for 1917 include $150,000 which was due in 1916, but which could not be collected until 1917 because of the transition from one method of collection to another, due to a new ordinance. The receipts in 1918 from new properties show a decrease of $41,000 from similar returns in 1917. In other words, there has not been in 1918 the normal rate of new building operations, and the water rent revenues of the city have been correspondingly decreased. This curtailment in building operations has

been reflected in another decrease in water bureau revenues for the item of pipe frontage, the receipts in this one item in 1918 being $21,000 less than similar receipts in 1917. The 1917 meter receipts responded to the increase in the meter rate that was effective the beginning of that year. This meter rate carried both gains and losses. The gains were effective January 1, 1917; the losses were not effective until January 1, 1918. The city is still benefiting by the gains because they are continuous, but during 1918 it was obliged to accept the losses incident to the new ordinance, and these have decreased the somewhat fictitious revenue record for 1917. The war and the influenza have had a definite influence on the 1918 revenues, and may result in a fictitious increase of the 1919 revenues. With its force decreased by war conditions and with the further handicap of the influenza epidemic occurring at the height of the meter billing period it was impossible for the water bureau to render the last quarter's meter bills early in November, as is contemplated by the ordinance. As a result probably from $50,000 to $100,000 of revenue earned in 1918 will not be collected until 1919."

Memorial to Soldiers Who Guarded Water Supply.

New York, N. Y.—A memorial is to be erected by the officers and men of the First Provisional Regiment to the members of the regiment who have died in service while guarding New York City's water supply during the war. A twenty-ton boulder from Bonticou Crag, in the Catskills, will be moved to Sleepy Hollow Cemetery, on the shore of Tappan Zee, by enlisted men of the regiment under the supervision of officers. The monolith will bear a tablet on which the names of the regimental dead will be inscribed.

STREET LIGHTING AND POWER

Court Upholds City's Share of Gas Receipts.

Columbus, O.—Ordinances passed in 1899 by the city of Columbus, requiring the Federal Gas & Fuel Company to pay annually into the city's general expense fund 10 per cent. of the gross amount received for the sale of gas to citizens, have been in effect upheld by the Supreme Court at Washington.

Hydroelectric Rates Must Consider Coal Costs.

Westfield, Mass.—The state gas and electric light commission has upheld the rates established by the Turners Falls Power and Electric Company and this town in a five-year contract signed last April. The town owns a municipal lighting plant which it has operated since 1899 and has generated in its station the electricity distributed. The Turners Falls company recently entered Westfield to supply energy to the Springfield street railway. The question of buying electricity from the company was then under debate, and in the franchise it was stipulated that the municipality should be free to buy and the company be required to sell to the town such energy as it might need at any time for distribution to its inhabitants or for municipal use. The subsequent contract calls for the delivery to the town for five years of all the electricity required by it, with a maximum of 2,000 kw. continuously available at the point of delivery and such additional amounts available as may be necessary upon twenty-four hours' notice to the company. The following rates were established: For the first 1,000,000 kw.-hr. delivered in any operating year, $0.012 per kilowatt-hour; for the next 1,000,000 kw.-hr., $0.011; for the next 1,000,000 kw.-hr., and for all energy in excess of 3,000,000 kw.-hr., $0.009. A coal clause provides for an increase in price to be paid by the town equivalent to 1 mill per kilowatt-hour for each dollar in excess of $5 per gross ton for coal delivered at the company's Hampden steam plant in Chicopee, and a corresponding decrease of 1 mill per kilowatt-hour for each dollar of coal cost below $4. At present the company's coal cost is about $8 per gross ton, making the rates 3 mills higher than the foregoing, with a range of from $0.015 to $0.012. In accordance with the contract, the town requested the commission to pass upon the fairness of the coal clause. After investigation, the commission's decision says:

In common with all hydroelectric companies, the Turners Falls company is obliged to supplement its water-generated by steam-generated power in order to provide reliable and continuous service, and it has recently put in operation a modern and well-equipped steam plant at Chicopee for this purpose. To what degree it will be called upon to supplement the [Connecticut] river's supply is a matter of almost pure speculation, subject as the problem is to the immutable laws of nature, but that year in and year out the plant will be called on to supply a substantial amount is certain. It is true that the cost of coal does not directly affect the cost of electricity generated by water, but it must be borne in mind that every unit of hydroelectric energy has to carry the cost of the auxiliary which takes the burden when the water power fails. In view then of all the circumstances affecting the parties to this agreement, the so-called excess-coal-cost charge provision of the contract may in general terms be regarded as reasonably applicable and workable as a fair measure of the increased cost due to coal in a modern and efficiently managed station such as this is. Taking into account then the life of the agreement, the board is of the opinion that the rates and excess-coal-cost charge are fair and do not require modification. The return of normal conditions and a longer experience with the bulk supply of electricity will test the soundness of this conclusion before the present agreement expires and enable the town to see what modification, if any, should be required upon its renewal. Meanwhile the citizens of the town may feel assured that in the mind of the board sound and good judgment has been exercised in securing for the town an abundant and reliable supply of electricity upon favorable terms.

Lighting Contract Renewed.

Woonsocket, R. I.—The Woonsocket common council has approved, following recommendation of the lighting committee, to contract with the Blackstone Valley Gas and Electric Company for a five-year period from July 1, 1918, for arc and incandescent street lights at the same prices that have prevailed on the last contract—namely, $25 per year for 292 80-candle-power incandescent lights and $85 yearly for 261 luminous arc lights, 76 volts, at a rate of $25 per year for incandescents, all new lights to be at the same price. This contract is to continue after July 1, 1923, until terminated by ninety days' notice by either party.

FIRE AND POLICE

U. S. Again Warns Philadelphia of Vice.

Philadelphia, Pa.—Secretary of the Navy Daniels has notified mayor Smith that immediate steps must be taken to check vice in Philadelphia or the Federal Government will exercise its police powers for the protection of soldiers and sailors. In a letter to the mayor Secretary Daniels quoted a charge by Lieutenant-Colonel Charles B. Hatch that "the conditions in Philadelphia have reverted, so far as the protection of soldiers and sailors is concerned, to the old conditions," which led to the Fosdick report and caused the navy to act last spring. Secretary of War Baker joined Secretary Daniels in denouncing the recent laxity of the city authorities, and the Daniels letter informed the mayor that, acting in conjunction with the War Department, "unless action is taken to give adequate and full protection to the soldiers and sailors in Philadelphia steps will be taken as will give the needed protection to thousands of young men in uniform who either must visit Philadelphia or be denied by the War and Navy Departments the liberty which ought to be given them." It is said that the following steps might be taken: A definite and final ban on Philadelphia as a port of debarkation, even for the soldiers of the city returning from France. The detail of a large force of military police, whose powers would supersede all those of the city police, for the protection of soldiers and sailors and the closing of dives. The insistence that Superintendent Robinson be again relieved. Secretary Daniels' letter says:

"Much against my inclination I found it necessary last spring to write you a letter, calling attention to the open and flagrant vice conditions in Philadelphia, which were having a serious effect upon the discipline and morals of the navy and army personnel stationed in or visiting in your city.

"At that time, in response to the request of this department, you assured Lieutenant-Colonel Charles B. Hatch, the representative of the Navy Department, that you would take action. This you did, and it resulted in immediate improvement of conditions. This improvement continued until recently, when I am now informed that the conditions in Philadelphia have reverted so far as the protection to soldiers and sailors is concerned to the old conditions which prevailed prior to my communication to you last spring, and that the change of your

policy was made in violation of the promise which you made to Colonel Hatch, the representative of the Navy Department.

"If these conditions, which have already grown materially worse, continue to be maintained it will be extremely difficult, if not impossible, for the War Department and the Navy Department to fulfill the solemn obligations made to the parents and communities from which these boys have come and to return them to their homes, in the words of the President, 'with no wounds except those borne in honorable conflict.'

"In view of the seriousness of the situation, fraught as it is with grave consequences, we must insist that during the period of demobilization the authorities at Philadelphia will suppress prostitution and other vicious conditions, and intrust this duty to those who are able to cope adequately with the situation. The necessity of such action is quite, if not even more, important in the period of demobilization than in the period of mobilization.

"I have had a conference with the Secretary of War with reference to the conditions at Philadelphia, and I am writing to you to say that we are both in accord, and unless necessary action is taken to give adequate and full protection to the soldiers and sailors in Philadelphia steps will be taken as will give the needed protection to the thousands of young men in uniform who must either visit Philadelphia or be denied by the war and naval authorities the liberty which ought to be given them. It is our duty to see that they have the same wholesome surroundings in Philadelphia that are afforded them in other cities, and this duty will not be evaded."

This action follows a charge by Lieutenant-Colonel Hatch that mayor Smith had broken faith with him in permitting James Robinson to be restored to the post of superintendent of police, with full powers. Colonel Hatch said that when he first learned through the newspapers that Robinson had been discharged from the army and would return to the police department to become the superior of captain Mills, who had been placed in charge at the suggestion of the naval authorities, he and the mayor had held a conference. According to Colonel Hatch the mayor gave him to understand that when Robinson returned captain Mills would not be shorn of any power; that Robinson would have the same small authority which he possessed just before he obtained leave to go into the quartermaster's department of the army, and that Mills would have full authority to continue the work of cooperation with Colonel Hatch that had been agreed upon when the matter was originally taken up by the municipal and naval authorities at the outbreak of the war. Accepting this assurance Colonel Hatch said he had recommended that Philadelphia be made a port of disembarkation for troops returning from the war zone, a concession which the mayor and many public-spirited citizens had sought. Mayor Smith asserts that when he discussed the subject with Colonel Hatch he had merely said that he "presumed" that Robinson would not be given full authority, but that later, when he discussed the matter with director Wilson, of the department of public safety, he had found that the director had decided upon the matter otherwise. The outcome was that captain Mills has been directed to take charge only of the vice situation, and has been made subordinate to Robinson, who has been ordered to "assist" Mills in any manner "possible."

Film Explosion Caused Fatal Fire.

Pittsburgh, Pa.—Ten persons are dead and a score of others suffering from injuries as the result of a spectacular fire and explosion which wrecked a film exchange building in Penn avenue. The damage is estimated at $1,000,000. Trapped by walls of flame which turned the interior of the building, an eight-story brick structure, into a raging furnace, some of the victims, mostly women, were hurled from the building by the explosion, while others jumped from windows or were saved in thrilling rescues by firemen. That a lighted cigarette, discarded into a pile of film scrap by a careless employee, caused the fatal explosion was the opinion expressed by Frederick Sauer, owner of the building, at a joint investigation held by the county, city and state authorities. Present at the inquisition, which was held at the coroner's office, were coroner Samuel C. Jamison, S. A. Dies, chief building inspector of the city, and S. E. Richardson, an inspector under the state department of labor and industry. In addition to Sauer, William Schoppol, watchman of the building, was interrogated. When Sauer was called to testify he admitted that he had been warned by city officials of the danger of the building in not having proper safety devices during the occupancy of a film establishment. He stated that he began last summer to make changes, placing a fireproof stairway in the building, concrete walls between the film rooms and erecting fireproof doors at each exit. He is of the opinion that had the occupants of the room where the fire originated closed the doors there would not have been any explosion. He admitted that there was no water sprinkling system in the building or hose connections on each floor. These safety devices were to be made, he said, but the contractor had not begun to make the repairs, although he had let the contract some time ago. Thus far those conducting the inquiries allege that they have found violations of the law. Five points were brought out by these investigators, as follows: First, on nearly every floor violations of the regulations for film safety; second, unprotected moving picture machine which had been in operation; third, films piled in boxes on top of radiators; fourth, rubber hose gas connected with pipe to obtain fuel for melting metal; fifth, cigarette butts in rooms on nearly every floor.

"Striking" Firemen Respond to Alarm.

Cleveland, O.—With two-thirds of the city's firemen absent from the stations in their effort to enforce the eight-hour day fire started in the four-story Euclid Building, in the heart of the downtown district. A general alarm brought twelve fire companies to the scene. With the arrival of fifty firemen who were off duty, including several engineers who manned idle engines, the fire was put under control. The Euclid Building was destroyed. Fire chief Wallace estimated the loss at $100,000.

GOVERNMENT AND FINANCE

Constitutional Amendments Approved.

Albany, N. Y.—The three amendments and the one proposition submitted to the voters of this state at the November general election were all carried, according to the official tabulation of election returns in secretary of state Hugo's office. Amendment No. 2, permitting the construction of a state highway from Saranac Lake and thence to Old Forge by way of Blue Mountain and Racquette Lakes, and of particular interest to the motoring public, was carried 609,103 to 299,899. Amendment No. 1, relating to the contracting of state debts and restricting the debt period to the probable life of the work and authorizing the issuance of bonds to be paid in annual installments by direct tax or legislative appropriation, was carried, 628,199 to 253,040. Amendment No. 3, of particular interest to residents of Utica, in that it pertains to a section of the Erie Canal in that city, was carried, 586,863 to 269,919. The one proposition submitted and which pertains to the sale of bonds for the construction and improvement of state and county highways, etc., was carried, 766,823 to 266,822.

May Assess Uncompleted Buildings.

New York, N. Y.—Supreme court justice Lehman, in a recent decision in the suit by the Orinoco Realty Company against the city tax department for a reduction of assessment establishes the fact that a new apartment building, still requiring a cleaning-up process and lacking a certificate of occupancy from the tenement house department on the official assessment date, October 1, is assessable. The realty company brought suit against assessing the building on the ground that it was not complete on October 1, and under section 889A of the charter should not have been assessed by the tax commissioners. The court said: "The statute does not provide that the construction of a building must be absolutely completed before it can be assessed for taxation. It may be assessed, even though it is still in course of construction where the construction has progressed so far that the building is ready for occupancy. No definite rule can, in my opinion, be laid down as to the stage a building must reach before it is ready for occupancy. Obviously, that depends to a great extent upon the purpose for which it is intended."

Council to Change Chairman Every Day.

Detroit, Mich.—By a vote of six to three, Detroit's councilmen-elect have decided at an informal meeting that the chairmanship of the committee of the whole, which is to meet daily, will be rotated among all the members of the council. Opposition to the plan was voiced chiefly by aldermen William P. Bradley and John C. Nagel. Alderman Bradley contended that "what was everybody's business was nobody's business" and that unless there were fixed chairmanships work of the council would lag. Alderman Simmons expressed belief that the personnel of the council was such that what was everybody's business would be everybody's business and the councilmen would be as diligent under either system, but that with no permanent chairmen every member would have to keep himself posted on all questions, to the city's profit.

TRAFFIC AND TRANSPORATION

Commission Denies Six-Cent Fare Plea.

Indianapolis, Ind.—According to an opinion handed down by the state public service commission the Indianapolis Traction & Terminal Company has been denied an increase in fare to six cents. The company is, however, permitted to continue to charge a five-cent fare until 100 days after the signing of the treaty of peace, but it was instructed to withdraw the one-cent charge for transfers on December 31. The commission says that in spite of the apparent increase in facilities the service rendered by the company remains inadequate. On the important subject of a return on the investment the commission says in part:

Petitioner does not plead for an order based on return on reasonable and prudent investment. The plea is for an order establishing rates that will maintain the solvency of petitioner by the payment of operating expenses and "maturing obligations."

In its original decision the commission passed finally and negatively on petitioner's contentions that fixed charges of securities, issued and outstanding, constituted legal and binding obligations which the state must recognize. With equal decisiveness the commission declined to recognize, even in acting under the emergency section, the inclusion of annual sinking fund charges as an obligation of patrons.

The commission reiterates its declaration that it will not become confused as to the mandate of the legislature, which, according to the interpretation under which it proceeds, is to take the value of the property used and useful for the service of the public as a basis for rates.

It is inconceivable that the legislature, in the enactment of section 122, contemplated that the state should (1) guarantee, in times of emergency, values which never existed; (2) protect excess securities; (3) make good losses caused by negligence in collection of revenues, or (4) reward a lack of thrift in times of prosperity.

The emergency section does not seem even to extend to the most meritorious petitioner the assurance of a return on investment that might be declared to be the proper rate of return in a normal period. To use the emergency section to protect obligations for which the commission is unable to find some reasonable basis in values would amount to making the state the protector of unwarranted obligations at the very time when there is a strong tendency for legislation to restrict issuance of unwarranted securities of all kinds.

Boston Elevated Under Trustee Operation.

Boston, Mass.—In announcing the recent increase of fare to eight cents, the board of trustees operating the company under the public control act issued a statement pointing out that the company fell short of its required revenue by $2,741,000 for the period from July 1 to Nov. 1. A 5-cent fare prevailed during July and a 7-cent fare was in effect during August, September and October. The cost of the service as defined by statute includes operating expenses, maintenance, fixed charges, a provision for depreciation and obsolescence and dividends on the invested capital. War conditions have enormously increased the cost of operation, and by reason of the shortage of labor the service has been necessarily impaired and provided on an unpreventable increase in cost. The increase in the cost of labor decreed by the War Labor Board has advanced the operating cost more than $3,000,000 yearly. The trustees believe that $2,000,000 annually should be allowed for depreciation, and the law requires the payment of $1,360,220 in dividends. The 7-cent fare produced an increase of only 23 per cent in gross earnings during August. During the period of the influenza epidemic the revenue fell off so that an average of only 9 per cent increase was obtained. The trustees considered fixing a fare above 8 cents, but deferred putting it into effect. The trustees realize the necessity of providing for adequate and satisfactory service and have already ordered new cars and equipment, which, received and installed, will materially improve conditions. More dependable and satisfactory service is also anticipated with the return of more normal industrial conditions. The income of the system for the four months from July 1 to Oct. 1, during which it has been under public control, is concretely expressed in the following table:

From 5-cent fares in July	$1,525,548
From 7-cent fares in August, September and October	5,326,483
Total from fares	$6,852,031
From special cars, etc.	45,859
From advertising privileges at stations, etc.	97,619
From other companies for use of tracks, etc.	16,627
From rent of buildings, etc.	23,243
From sale of power, etc.	12,209
From interest	32,255
Total income	$7,079,847

The total income from all sources for the corresponding four months of 1917 was $6,520,576. The total cost of service, exclusive of dividends, for the four months of control under public management, has been $9,397,239 as against $6,559,335 for a similar period in 1917. A factor in this extra cost is the increased labor payments which were brought about through the decree of the National War Labor Board. Another important factor in the cost of service has been the payment for rent of the Dorchester Tunnel. The payment of dividends required under the act totaled $424,240 during this time, making the total cost of the service in accordance with the legislative act $9,821,479, as against $6,977,225 last year, an increase of $2,844,254. The deficiency, therefore, between the income and cost of service for these four months from July 1 to Oct. 1 amounts to $2,741,631. The trustees also submit the following comparative table of income from fares:

	1918.	1917.
July	$1,525,538	$1,570,856
August	1,915,260	1,544,354
September	1,722,738	1,533,629
October	1,688,495	1,639,196
Four months	$6,852,031	$6,288,035

Voters Approve Higher Fare.

Cedar Rapids, Ia.—At a recent special election the voters authorized the Cedar Rapids & Marion City Railway to increase its fares to six cents by a majority of 78. It went into effect at once. Previous to the election a commission made up of representatives of the Chamber of Commerce, union labor and leading citizens recommended to the city council that the increase be granted. The fares on the lines of the Iowa Railway & Light Company, which also operates in Cedar Rapids, were not covered by city franchise, but the Cedar Rapids & Iowa City Railway, which is included in the system of the Iowa Railway & Light Company, assumed a six-cent fare at the time that rate was granted to the Cedar Rapids & Marion City Railway. Last February the local branch of the railway union submitted a new wage demand to the Cedar Rapids & Marion City Railway. The matter was debated for several weeks. Finally the men were informed that the increase in wage would be allowed effective at once provided the city council would grant an increase in fares. The council found itself powerless to do anything under the terms of the franchise, but after it was suggested that the matter be left to a vote of the people the council gave its consent. The local chamber of commerce and the federation of labor indorsed the six-cent fare, and during the ten days previous to the election made an open and vigorous campaign in its favor. The voters were informed that if the measure was defeated it would almost certainly mean unsatisfactory service and might even result in the abandonment of some lines. The railway took no part in advocating the increase. Some opposition developed to the proposed increase in fares, but the vote in the wards inhabited by those dependent almost entirely on the railway for transportation was "yes," while the "no" vote was cast in the wealthier wards. The Cedar Rapids & Marion City Railway is controlled by the United Light & Railways Company. It operates in all 27.5 miles of line, a considerable part of which is in Cedar Rapids.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading ones published in other countries, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on muncipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

ROADS AND STREETS.

Concrete Pavements:

Wayne County's Concrete Roads. Report of county road commissioners on condition of concrete roads under enormous increase in traffic; changes in construction methods. 1,400 words. Municipal Journal, December 14. 10 cts.

Road Construction Methods in Wayne County, Mich. Salient points of practice developed during ten years of experience in building concrete pavements. 1 ill., 600 words. Good Roads, December 14. 10 cts.

Wider and Two-Course Roads in Wayne County. The commissioners of Wayne County, Mich., in their last annual report, tell of a number of changes made in the specifications for concrete roads. 400 words. Municipal Journal, December 7. 10 cts.

Reinforced Concrete Track for Testing Motor Trucks. Constructed for the primary purpose of trying out trucks manufactured for the Government; built by the Diamond T Motor Co. at its Chicago plant. 4 ills., 350 words. Engineering and Contracting, December 4. 15 cts.

Weston Road Concrete Pavement. It was decided to build 16 different types of pavement in order to judge as to which, if any, would be suitable for future work; traffic census given. 7 ills., 1,800 words. By E. A. James, chief engineer, Toronto and York Roads Commission. Canadian Engineer, December 26. 15 cts.

Development of Concrete Road Construction. Excerpts from one of the "J. E. Aldred lectures on engineering practice" at Johns Hopkins University. Manner in which new traffic conditions have affected the use of concrete as a road surfacing material. By A. N. Johnson, consulting engineer, Portland Cement Ass'n. 1,800 words. Canadian Engineer, December 5. 15 cts.

Asphalt Pavements:

Asphalt Pavement Construction in Rainy Weather. Interesting observations are given by T. G. Marriott, in a recent issue of "The Surveyor," on the laying of Trinidad asphalt macadam in Oxford, England, the contract providing for the continuous prosecution of the work during the winter weather. 1 chart, 1,000 words. Engineering and Contracting, December 4. 15 cts.

Block Pavements:

Construction Procedure in Repaving Lakewood, Ohio, with Granite and Wood Block. Five-inch granite block to be used on two miles and wood block on the remaining mile. 1 ill., 500 words. Municipal and County Engineering, December. 25 cts.

Blast Furnace Slag Used for Base and Cushion of Brick Pavement on National Highway. 13¾ mile section recently completed between New Concord and Zanesville, O.; rebuilt by order of the Government as a necessary war measure. 1 ill., 500 words. Engineering and Contracting, December 4. 15 cts.

Construction Methods:

Dynamiting a City Street. Removal of concrete in pavement in Warren, Pa., by use of dynamite with a minimum of labor and cost. From the DuPont Magazine. 300 words. Municipal Journal, December 14. 10 cts.

Machine for Removing Street Railway Tracks from Paved Streets. By means of a specially designed machine the Los Angeles Ry. Co. has been able to pull out 120 lineal feet of track per hour. 1 ill., 400 words. Engineering and Contracting, December 18. 15 cts.

Construction Methods Employed in Building Lincoln Highway Cut-Off Across the Desert at Gold Hill, Utah. Conditions very difficult; use of hay to keep heavy equipment from bogging down; design of roadway. By R. E. Dillree, construction engineer, Utah State Road Commission. 12 ills., 2,700 words. Municipal and County Enginering, December. 25 cts.

Self-Feeding Bucket Loader Facilitates Handling Crushed Rock on Paving Job. Used by Ryan Brothers for paving North Broadway in Chicago. 1 ill., 400 words. Engineering and Contracting, December 4. 15 cts.

Day Labor, Force Account Work and Bonuses. Discussion of advantages and disadvantages of performing road work by day labor and by contract, with notes on the working of the bonus system. By Chas. M. Upham, chief engineer, Delaware State Highway Department. 2,500 words. Good Roads, December 21. 10 cts.

Road Planning:

Pavement Layouts Inadequate for Motor Traffic. Increasing the curb radius will do much toward relieving congestion. 3 ills., 900 words. Engineering and Contracting, December 4. 15 cts. By Wm. M. Kinney.

Necessity for the Proper Location of Roads. A list of things to note in locating a road. By a Dennis Williams, Assoc. M. Am. Soc. C. E. 900 words. Good Roads, December 14. 10 cts.

Superelevation of Highway Curves. Design of cross-section of pavements on curves and formula for safe speeds on curves of varying degrees. By R. A. Meeker, former state highway engineer of New Jersey. 4 ills., 1 table, 700 words. Good Roads, December 7. 10 cts.

Principles Controlling the Layout, Marking and Maintenance of Trunk Highways Systems. Detailed account of methods followed by Wisconsin recently in inaugurating a 5,000-mile system of state-maintained highways; patrol system, paid for by state, is administered by counties. Paper read before the Joint Highway Commission, by A. R. Hirst, state highway engineer of Wisconsin. 1 ill., 2,500 words. Engineering News-Record, December 19. 20 cts.

Relation of Highways to Motor Transport Efficiency. Rapidly developing demand for the creation of a system of inter-state highways to be constructed and maintained under the supervision and at the expense of the Federal Government; waste of funds attributable to having highway work in the hands of laymen. Address by Arthur H. Blanchard, president of the American Road Builders' Ass'n. 1,600 words. Engineering and Contracting, December 4. 15 cts.

Heavy Traffic Highways. Discussion of the construction of roads to accommodate increasing weight and of the limitation of truck weights and loads. From the annual report of the Department of Public Highways of the province of Ontario, Canada. 2,000 words. Good Roads, December 7. 10 cts.

Relation of Highways to Motor Transport Efficiency. Technically trained men should be employed to build roads, old practice should be modified and maintenance should be given attention. By Arthur H. Blanchard, president American Road Builders' Ass'n. 1,800 words. Good Roads, December 14. 10 cts.

Road Work:

Road Work of the Department of Agriculture. Extracts taken from the 1918 report of Secretary D. F. Houston and submitted to the President. 1,400 words. Good Roads, December 14. 10 cts.

Proposed Highway System for Minnesota. Description of the 6,000-mile system of main roads proposed by the State Highway Department, with a statement by Commissioner Babcock. 1 ill., 800 words. Good Roads, December 28. 10 cts.

Michigan Road Plans. Greater state control and bond issue likely to come before next legislature. 200 words. Good Roads, December 14. 10 cts.

Miscellaneous:

The Road: Its Paramount Importance as Viewed by a Briton. Great advance in road construction and maintenance methods; disintegration of old roads; making roads impervious to water. By J. H. A. McDonald, K.C.B., LL.D., writing in Chamber's Journal, London, England. 3,500 words. Municipal and County Engineering, December. 25 cts. 3,500 words. Pacific Municipalities, December. 30 cts.

The Aims of Engineers Engaged in Road Work. Necessity of having work done by skilled engineers. By Rodman Wiley, commissioner of public roads of Kentucky. 3,000 words. Municipal and County Engineering, December. 25 cts.

"Imaginative" and "Speculative" Highways for To-morrow. In planning, broad vision will be necessary; roads will be built much wider and stronger, and æsthetics as well as utility will affect design. By H. G. Shirley, secretary, Highway Industries Association, from paper read before the Joint Highway Congress, Chicago. 3,000 words. Engineering News-Record, December 26. 10 cts.

Why Federal Government Should Vastly Increase Its Appropriation for State Aid in Road Building. Social and industrial need of a great system of hard roads in America. Reduction in cost of transportation only one of the economic ends attained by building hard roads. 1,300 words. Engineering and Contracting, December 4. 15 cts.

Highway Improvement and Land Reclamation as Means for Providing for Returned Soldiers. Good roads saved Paris; reclaim the arid lands and drain the wet lands. Abstracts from an address by Franklin K. Lane, Secretary of the Interior. 1,400 words. Engineering and Contracting, December 4. 15 cts.

Road Work Now and in 1919. Editorial comment on two statements issued by Federal officials showing the importance attached to highways and highway traffic by some branches of the Federal Government; the snow removal problem. 750 words. Municipal Journal, December 7. 10 cts.

Representative Highway Congress in Chicago Unit for National System. Interstate motor-truck transportation here to stay; enlarged Federal-aid appropriations approved. 3,000 words. Engineering News-Record, December 19. 20 cts.

State Highway Officials and Highway Industries Associations to Meet at Chicago, Ill. Historical and descriptive sketches of the American Association of State Highway Officials and the Highway Industries Association; personnel of the officers and committees; program of the Chicago convention. 9 ills., 4,000 words. Good Roads, December 7. 10 cts.

President and Cabinet Officers Favor Additional Federal Road Expenditures. Wilson, Houston and Baker advocate highway work to develop transportation and provide employment. 400 words. Good Roads, December 7. 10 cts.

Waterproof Floors for Railway Crossings Over Streets. Grade-crossing work makes severe demands; troughing unsatisfactory; concrete slab floor; various methods of sealing concrete to girders. By H. T. Welty, engineer of structures, N. Y. C. R. R., New York. 9 ills., 3,500 words. Engineering News-Record, December 12. 20 cts.

Damage Suits from Street Defects. Sufficiency of notice, in bringing action for injury, as to location of defects in street by which injury was caused; court decisions in the various states. By John

Simpson. 2,300 words. Municipal Journal, December 14. 10 cts.

Corrugated Pipe for Road Drainage. Well adapted to meet the rough-and-ready conditions of county highways; withstands strains from freezing and thawing soil. 4 ills., 700 words. Engineering and Cement World, December 1. 15 cts.

Experience of various Counties in Utilizing Local Deposits on County Construction Projects. Rising prices and shipment difficulties have compelled county engineers to give more attention to obtainng materials from local deposits. 8 ills., 2,200 words. Municipal and County Engineering, December. 25 cts.

Hauling Heavy Girders Through the City Streets. A letter of protest to the editor from Herbert W. Alrich, N. Y. C. 1,200 words. Engineering News-Record, December 5. 20 cts.

SEWERAGE AND SANITATION

Sewers:

Frankford Creek Intercepting Sewer. Some unusual features of work in Philadelphia; grit chamber; overflow chamber; pressure conduit; sewer laid on surface. 4 ills., 2,200 words. Municipal Journal, December 14. 10 cts.

Riverside Drive Sewer, Cleveland. A $90,000 main sewer now beng constructed on a beautiful drive in Lakewood, a suburb of Cleveland. 1 ill., 350 words. Canadian Engineer, December 5. 15 cts.

Some Sewer Construction Details. Small pumping stations; laying a sewer above street grade; excavating and laying sewer in deep trench in sand and water. 2 ills., 1,500 words. Municipal Journal, December 28. 10 cts.

Sewage Treatment:

Promising Results with Miles Acid Process of Sewage Treatment in New Haven Tests. Good removal of suspended and settleable solids and bacteria; effluent and sludge stable; grease utilization problems; local conditions favor process at New Haven. 2,800 words. Engineering News-Record, December 5. 20 cts.

Chicago Faces Sewage Disposal Problem. Federal Government may restrict the flow from Lake Michigan, in which case the state government would be justified in requiring the construction of works for treatment of sewage. By C. D. Hill, engineer of the Board of Local Improvement, Engineering News-Record, December 19. 20 cts.

Sewage Disposal from an Operator's Standpoint. Problem of sewage disposal becoming more important as the smaller towns and villages increase, and the pollution of the rivers and streams must be minimized. Abstracted from "Western Municipal News," by Wm. K. F. Durrant, Moose Jaw. 2,000 words. Canadian Engineer, December 12. 15 cts.

Cleaning Septic Tank at Camp Lee. Use of the Otterson Auto-Eductor at the camp. Test made shows that it will handle satisfactorily the type of material usually found in grit chambers. 1 ill., 1,000 words. Municipal Journal, December 28. 10 cts.

Stream Pollution:

Control of Stream Pollution. Use of streams for waste disposal; effect of stream pollution; temperature, depth and velocity; self-purification of streams; summary of present status and remedy. By Prof. Earle B. Phelps, American Public Health Service, Washington, D. C. 4,300 words. Canadian Engineer, December 12. 15 cts.

Dissolved Oxygen as an Index of Pollution. Results of tests show a surprising and persistent decline in the degree of saturation in all parts of the New York harbor and lower East Rivers. Paper read before the American Public Health Ass'n. By Kenneth Allen, engineer of sewage disposal, N. Y. C. 3 tables, 800 words. Canadian Engineer, December 19. 15 cts.

Sanitation:

Public Health and Private Precaution. Editorial on the duty of city, state and country to establish a more perfect public health. 1,500 words. Municipal Journal, December 14. 10 cts.

Public Health Requires Engineering Service. Convention considers medical, technical and administrative problems of sanitation and industrial housing. 1,000 words. Engineering News-Record, December 19. 20 cts.

State Board of Health Reform. Abstract of paper read before the New Jersey Sanitary Association, pointing out the deficiencies of the New Jersey State Department of Health and the vital need of reform. By M. N. Baker, lately member of the New Jersey State Board of Health and associate editor of Engineering News-Record. 600 words. Municipal Journal, December 21. 10 cts.

Public Health Nursing in Manitoba. Illustrated by visits to municipalities of Rockwood and Assiniboia; series of public meetings throughout the various school districts to arouse interest in this important activity of health education. 5,000 words. Western Municipal News, December. 15 cts.

The Influenza-Pneumonia Pandemic in United States Army Camps. Over 1 in 5 had influenza and 1 in 30 had pneumonia; combined death rate exceeded 14 per 1,000. By Maj. George A. Soper, Sanitary Corps, U. S. A. 3 tables, 700 words. Engineering News-Record, December 26. 20 cts.

The Sanitary Inspector. His Duties, Qualifications, and a Few of his Difficulties. By H. G. Buck, Royal Sanitary Institute, Saskatoon, Sask. 2,500 words. Western Municipal News, December. 15 cts.

Extra-Cantonment Zone Sanitation. Control of communicable diseases; free inoculation and vaccination; milk inspection; restaurants; barber shops; publicity; financial. (Concluded from page 425.) By W. A. Hardenbergh, assistant sanitary engineer, U. S. Public Health Service. 2 ills., 2,800 words. Municipal Journal, December 7. 10 cts.

Miscellaneous:

Relation of Main Drainage to River and Harbor Front Improvement in Various Cities. Improvement of water front largely dependent upon improvement of sewerage system. By Morris Knowles and John M. Rice, engineers, Pittsburgh, Pa. 2,300 words. Municipal and County Engineering, December. 25 cts.

South Haven Waterworks and Sewers. Cost of pumping water during 1917-1918, and cost of sewer construction. 500 words. Municipal Journal, December 28. 10 cts.

Design and Operation of Automatic Sewage Pumping Station at West Haven, Conn. Cost of electric current. By Clyde Potts, civil and sanitary engineer, N. Y. C. 2 ills., 1,200 words. Municipal and County Engineering, December. 25 cts.

WATER SUPPLY

Water Works Operation:

Waterworks Operation. Thawing mains, services and fire hydrants by electricity; methods and appliances used; comparative popularity of different methods. 1 ill., 2,600 words. Municipal Journal, December 7. 10 cts.

Waterworks Operation: Maintenance of Reservoirs. Features of maintenance of small reservoirs and of large impounding reservoirs; sodding and other treatment of embankments. 3,400 words. Municipal Journal, December 28. 10 cts.

St. Louis Waterworks Operation. Interesting features of last year's work of the department; removing sand from an intake tunnel; ice trouble at intakes; reconstructing Compton Hill reservoir; organisms in reservoirs; sterilizing conduits. 2 ills., 2,500 words. Municipal Journal, December 21. 10 cts.

Protecting Water Mains, Fire Hydrants and Valves Against Freezing in Winnipeg, Manitoba. By Thos. H. Hooper, operating superintendent of waterworks, Winnipeg. 800 words. Municipal and County Engineering, December. 25 cts.

Lead Pipe Couplings. Discussion of joints used in service pipe conections. By J. A. Jensen. 1,800 words. Journal of American Waterworks Association, December. $1.10.

How to Prevent Freezing of Riser Pipes to Elevated Water Supply Tanks. Preventive measures recommended by "The Water Tower," the organ of the Chicago Bridge and Iron Works. 1,100 words. Municipal and County Engineering, December. 25 cts.

Water Meters:

Water Meters Should be Selected with More Care. Loss of head varies greatly with different makes; right choice saves money; plumbing adjustments help. 3 ills., 1,100 words. Engineering News-Record, December 12. 20 cts.

Selection of Water Meters. Adapting meter to special requirements of each service may permit economy in the purchase of meters; appliance for measuring rates of flow in individual services; loss of head. By Caleb Mills Saville, manager and chief engineer of the Water Department, Hartford, Conn., from a paper read before the New England Waterworks Ass'n. 5 ills., 2 tables, 3,700 words. Municipal Journal, December 7. 10 cts.

Buffalo Water-Waste Survey Saves Water, Coal and Labor. Pitometer, house-to-house inspection and fixture repairs, produce remarkable results, with city only half covered. By Geo. C. Andrews, water commissioner, Buffalo, N. Y. 1,500 words. Engineering News-Record, December 5. 20 cts.

Pumping:

High Efficiency Shown by Motor-Driven Waterworks Pumps at St. Paul, Minn. Manufactured by the De Laval Steam Turbine Co., of Trenton, N. J. 2 ills., 1,500 words. Municipal and County Engineering, December. 25 cts.

Buckwheat for Waterworks Boilers. Philadelphia had installed twenty coke stokers, utilizing the smaller sizes of anthracite coal. By Carleton E. Davis, chief of bureau of water, Philadelphia. 500 words. Canadian Engineer, December 26. 15 cts.

Purification:

Chicago Introduces New Chlorinator. The new Mayfair station has five triple-expansion plunger engines with a combined daily capacity of 110,000,000 gallons; chlorine solution applied by pipes extending 55 feet below the upper tunnels which lead to the pumps. By John Ericson, city engineer, Chicago. 2 ills., 1,500 words. Engineering News-Record, December 19. 20 cts.

Significance of Black Sands in Filters. Dark color of sands in many plants in Kansas due to manganese and iron. By J. E. Welker and C. C. Young, from paper read before the American Waterworks Ass'n. 1 table, 1,500 words. Canadian Engineer, December 26. 15 cts.

Water Treatment at Council Grove, Kansas. Results secured under peculiar difficulties after three years of operation of the waterworks station at Council Grove. By Louis L. Tribus. 4 ills., 1 table, 2,400 words. Canadian Engineer, December 19. 15 cts.

St. Louis Water Purification Plant. Amounts and prices of chemicals used; methods and results of operation; cleaning filter sand; the strainer system; entrained air; effects of chemicals on apparatus; itemized cost of operating plant. 3,800 words. Municipal Journal, December 28. 10 cts.

Water Filtration at Minneapolis. The filtration plant consists of a 7.5-million-gallons sedimentation basin, 4 coagulation basins, 16 filter beds, and a 45-million-gallon covered clear-water reservoir. 400 words. Municipal Journal, December 28. 10 cts.

Miscellaneous:

National Control of Watersheds. Discussion by an English waterworks engineer of the advantages of such control and some of the problems connected therewith. Paper before the Municipal Waterworks Association at Birmingham, England, by Charles G. Hengell, waterworks engineer at Leeds, England. 1,500 words. Municipal Journal, December 7, 10 cts.

Investigations of Pipe Corrosion in Chicago Buildings, with Special Reference to Durability of Pipe Materials. Method of investigation; chemical test of pipe; design of drainage system in Chicago; all corrosion internal; proportioning pipes to suit number and size of fixtures. By Thos. J. Claffy, ass't chief sanitary inspector, department of health, Chicago, Ill. 3,200 words. Municipal and County Engineering, December. 25 cts.

The Reconstruction of a Municipal Water and Light Department. The experience of Columbia City, Ind. By Frank T. Schults, supt., Columbia City Light and Waterworks Dept. 3 ills., 2,500 words. American City, December. 35 cts.

Trend of Wages Paid by American Waterworks. Interesting studies of the increase in cost of labor were recently reported in the Journal of the American Waterworks Association, September, 1918. Conditions in 50 plants. Outlook for reduced cost in operation not encouraging. By Leonard Metcalf, of Wetcalf & Eddy, consulting engineers, Boston. 1,700 words. Municipal and County Engineering, December. 25 cts.

Commission Control Does Not Remove Hazard of Utility Investment. Ruling in Indianapolis water-rate case makes company share war risk and modifies former commission's position. By Leonard Metcalf, consulting engineer, Boston. 2,500 words. Engineering News-Record, December 19. 20 cts.

(To be concluded next week)

NEWS OF THE SOCIETIES

Feb. 18-21, 1919.—AMERICAN ROAD BUILDERS' ASSOCIATION. Sixteenth annual convention and Ninth American Good Roads Congress under the auspices of the A. R. B. A., Hotel McAlpin, New York, N. Y. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

Nov. 12-14, 1919.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

American Public Health Association.

While the influenza epidemic was necessarily the principal subject for discussion at the recent forty-sixth annual meeting of the American Public Health Association, held in Chicago, little of definite help was decided upon. Disagreement among the experts on many vital points marked the conferences.

Ninety per cent. of the deaths from influenza and pneumonia are preventable when a properly prepared vaccine is used, according to an address by Dr. E. C. Rosenow of Rochester, Minn.

Dr. Rosenow read figures on the results of innoculations around Rochester, showing that after the third innoculation there were nine cases of influenza per 1,000 against 220 per 1,000 among the uninnoculated and one and eight-tenth cases per 1,000 of pneumonia against fourteen per 1,000 among those not innoculated. More than 20,000 persons were given the three innoculations and their cases were compared with 61,000 not given the treatment. The deaths from influenza and pneumonia among those innoculated were one-tenth those among the uninnoculated, Dr. Rosenow showed.

Surgeon-General Blue, head of the United States Public Health Service, said that nearly 350,000 death occurred among civilians from September 1, 1918, to December 1, 1918, from influenza and pneumonia. He had no figures on the epidemic in the army camps.

Surgeon-General Blue came to arouse the health officials attending the meeting to a realization of the problem confronting communities when the armies are demobilized.

"The conditions after the war with demobilization of troops and resumption of immigration from areas in which sanitation has been necessarily neglected constitute a situation of far greater menace to the health of the nation than has previously existed," he said. "Public health officials must be prepared for increased demands from the soldiers themselves, for they have seen certain measures of hygiene and sanitation insisted on as indispensable to good health. The proportion of rejections by draft boards because of physical defects affords eloquent testimony to our physical shortcomings. The health administration program must include health supervision of school children and children of pre-school age."

Dr. Woods Hutchinson of New York said that gauze masks and vaccine were about the only successful methods of fighting influenza. He declared that quarantines and the closing of all public meeting places were "a relic of barbarism," with no value whatever. "With every one wearing masks in San Francisco," said Dr. Hutchinson, "the number of cases of influenza was brought from 2,300 a day down to 300 a day within six days, and business went ahead as usual. They vaccinated 81,000 there, with almost no deaths among those thus immunized."

The mask also served to control epidemics of whooping cough and chicken pox in San Francisco, Dr. Hutchinson said, and should prevent epidemics of other diseases like scarlet fever, where the germs are carried in the nose and throat.

Dr. Hutchinson said that doctors in hospitals protected themselves by masks, but would not insist on them for civilians.

Dr. Hutchinson said the influenza epidemic which many health officers believed came from the battle fronts in Europe was returning there now.

Health commissioner E. H. Bullard of Kansas City summarized the aim of most of the delegates by saying:

"We came here to find the means of prevention and cure, and the public expects it of us. We still have the influenza with us, and our experiences have not yet shown us the successful way to combat the disease. We have closed up twice, and once the cases increased and once the number declined, each time probably due to the spread or decline of the epidemic itself rather than our quarantine action. But we must take back to our communities some reasonably definite results."

"The various communities for which we are working will know that we have at hand the best available information science has yet discovered concerning the disease," said Dr. Charles J. Hastings of Toronto, Can., retiring president. "We cannot expect to draw up a definite program for combatting influenza epidemics when we see so wide a divergence of opinion among medical authorities as has been shown here."

Health officers from the Southeast, especially Dr. S. W. Welch of Montgomery, Ala., favored strict quarantine measures, and those from smaller cities were moderately favorable to quarantines and the use of masks; while health officers of the larger cities opposed both these measures and placed great reliance on vaccine.

"After all it is a question of applying to your own community the most practical remedies for the conditions encountered there," said Dr. Welch.

Health commissioner Dr. J. W. Inches of Detroit led the argument against closing public meetings, schools, theatres and stores, though he said his state compelled him to adopt some restrictive measures. He ridiculed the use of the mask as not a feasible measure in the largest cities.

On the other hand, Dr. J. A. Hayne of Charleston, S. C.; Dr. M. J. Flannigan of Richmond, Va.; Dr. W. R. Stokes of Baltimore, and Dr. W. E. Moore of Sioux Falls, S. D., held that closing public meetings in rural districts was efficacious.

Professor C. E. A. Winslow of Yale, professor of public health, offered a solution of the difficulty in resolutions favoring a dual system to keep things open in large cities, where inspection was easier, and to close public meetings and schools in rural communities, where such measures would keep people more in the open air.

Dr. W. H. Park, of the Committee on Vaccines, said in his report that the disease was due to an "undetermined organism," and the dominating variety of the organism differed according to various localities. His report condemned the indiscriminate use of "stock vaccine," and held that the vaccine should be used only in controlled cases until its efficacy could be established. He admitted that the most generally used form of vaccine offered some protection against the secondary or more serious stages of influenza, but little against the mild form of the disease, and added that the vaccine generally had not been used until the peak of the disease, thus proving little.

Frederick L. Hoffman of Newark, reporting for the Committee on Vital Statistics, said nearly 400,000 had died in this country the last three months, and they were chiefly men between twenty and forty years old.

Dr. W. C. Woodward, reporting for the Committee on Relief Measures, outlined a program for organization of hospital facilities, doctors, nurses and other public health agencies to be prepared for a severe recurrence of the epidemic.

Four committees of the association were chosen to organize the work of teaching cities and communities to prevent or control outbreaks of influenza. One committee will compile statistics on the recent influenza epidemic; another will devise and circulate the best known measures of prevention; another will handle measures of relief for convalescents, and the fourth will investigate vaccines and serum. The chief effort of the annual meeting was to organize the coming year's work along the lines of these four committees, according to Dr. Lee K. Frankel of New York, treasurer of the association. "These committees are to act in the interest of public health boards and officials all over the country and standardize, if possible, the means of preventing another such epidemic as the one now passing."

In discussing "Democracy and Public Health," Dr. Charles J. Hastings of Toronto, Can., in his presidential address at the opening session, pleaded for better care for the child and "to give our boys the democracy they have

(Continued on page 60)

INDUSTRIAL NEWS

Iron and Steel Conditions.—There is little evidence that the demand for steel products will experience a revival in the near future. A common view is that the capacity operation for the steel industry is at least six months away. There has been practically no new buying, and specifications against old contracts have been very light. The steel that is being produced is all of more or less special character. The steel producers intend to hold existing prices as long as they can. That may not be a difficult task for a time, as there is practically no temptation by way of buying demand to cut prices.

Production of pig iron and steel in December proved decidedly heavier than was expected, the month not showing the slowing down in operation that must necessarily follow the sudden ending of the war. The real slowing down is therefore to come during the next few weeks, and may be accentuated by the fact that production was continued through the old year at such a heavy rate.

Already the steel mills are operating at a much lower rate than in December, some estimates placing the rate as low as 65 per cent. of capacity. This would be a rate of 32,000,000 tons a year in steel ingots compared with actual production in 1918 of 42,000,000 tons and in 1906 of 22,000,600 tons. The enormous steel making capacity now in existence is thus recognized, for in 1906 there was an extremely heavy demand from all quarters, and the existing capacity was pushed to its utmost throughout the year, while a 65 per cent. operation of present capacity means 40 per cent. more tonnage than was made in 1906.

If adoption of the new form of finished steel sales contract becomes general, as is confidently predicted in some quarters in the trade will be the case, the steel trade's method of doing business will be revolutionized. Hitherto contracts for finished steel, except such steel as was definitely ordered for some particular job of construction, have amounted practically to options, the buyer specifying or giving actual shipping orders if it suited him, otherwise ignoring the contract. When the market advanced the buyer would specify in full, and as the mills commonly oversold in order to make sure of operating they would then fall behind in deliveries. When the market declined the buyer would expect adjustment of price. That is what has just occurred, as a matter of fact, as shipments against existing contracts are now being commonly made at the reduced prices that became effective last month. The new contract provides "liquidated damages" if the buyer fails to specify, on the one hand, or if the mill fails to ship on time, on the other hand. Faced with the necessity of making such a payment both buyer and seller would be much more conservative in making contracts if the proposed form were used. The buyer would purchase only the material he was certain he could use, and the mill would sell only the tonnage it was certain to be able to deliver on time. "Unfilled tonnages" reported would be much smaller than in the past, but they would be "unfilled orders" rather than "unfilled obligations." When the market became weak the mills would not find themselves without shipping orders when they had millions of tons of pseudo business on books.

Exporting Asphalt Paving Equipment.

The market in foreign countries for American equipment used in asphalt pavement construction appears to be developing rapidly. **The F. D. Cummer & Son Co.,** Cleveland, O., is receiving many inquiries from South America, and has recently shipped asphalt plants to Ecuador and Cuba. While the company has a fair amount of stock on hand and will be able to make prompt shipments of a limited number of plants in early spring, new conditions indicate that orders should be placed promptly if disappointment is to be avoided.

Commerce Department Talks Over War Industries Board Activities.

The functions which have hitherto been exercised by the Conservation Division and the War Prison Labor and Waste Reclamation Service of the Labor Division of the War Industries Board will be continued by the Department of Commerce which has established for that purpose the Industrial Cooperation Service and the Waste Reclamation Service, both of which will be temporarily installed in their present quarters in the building of the Council of National Defense. The work of the new services will be voluntary so far as the industries are concerned without any element of compulsion, depending on consent to methods approved by common counsel and trade experience. In connection with the Industrial Cooperation Service, the following-named gentlemen, most of whom were heads of divisions of the War Industries Board, have consented to serve as unofficial commercial advisers of the Secretary of Commerce:

Samuel P. Bush—Forgings.
W. B. Dickson—Steel.
Thomas E. Donnelley—Pulp and paper.
Charles H. MacDowell—Chemicals.
Edwin B. Parker—Former priorities commissioner, War Industries Board.
Thomas C. Powell—Railroad transportation.
William M. Ritter—Lumber.
Walter Robbins—Electricity.
A. W. Shaw—Former chairman, Conservation Division, War Industries Board.
Pope Yeatman—Nonferrous metals.

Other gentlemen have been invited to serve and replies from them are awaited. In connected with the Industrial Cooperation Service Mr. A. W. Shaw, chairman of the Conservation Division of the War Industries Board, has kindly consented to give his assistance in supervising the transfer of the work and in starting it upon its new basis. Mr. Hugh Frayne, chairman of the Labor Division, War Industries Board, and a former member of that board, has been similarly courteous in connection with the work of the Waste Reclamation Service.

It is the purpose of the Department of Commerce through both of these important services to keep in close touch with the industries and under its organic law, which calls upon it to foster, promote, and develop the industries of the country, to assist them in every practicable way. The services now created from the activities of the War Industries Board will permit greatly enlarged usefulness to the commerce of the country. The Bureau of Foreign and Domestic Commerce has long actively promoted the interests of our commerce abroad; the Bureau of Standards is affording, with greatly extended facilities created during the war, that scientific support to all industries which has been the basis upon which Germany so successfully built her commerce before the war. The Industrial Cooperation Service dealing with problems of commercial standardization, of the saving of industrial wastes, of greater effectiveness in production and sale, in the removal of hurtful and uneconomical trade practices, will substantially complete the cycle of helpfulness and with the Waste Reclamation Service will form a rounded whole of aid to commerce especially needed in the present days of readjustment and in the future days of competition to follow.

Truck Contracts Cancelled.

It has been officially announced that orders for from 25,000 to 28,000 motor trucks of the "B" type have been canceled. These were distributed among twenty-one concerns. Production on the orders had not started.

The Garford Motor Truck Company, Lima, O., announces that S. M. Williams, president of the Highway Industries Association, and for the past four years sales manager of the company, has been relieved of his duties as sales manager to take charge of the new department of highway development which has been established by the company.

The Wheeler Condenser & Engineering Company, Carteret, N. J., announces that it has obtained from the Schutte & Koerting Company, of Philadelphia, through the Alien Property Custodian, the exclusive right to manufacture and sell steam jet air pumps under patent No. 968,926 in connection with surface condensers, jet condensers, barometric condensers, vacuum pans and evaporating apparatus.

This patent covers the valuable fea-

ture of two or more steam jets working in series with a condenser between the jets—a feature claimed to enable this type of pump to perform a given duty much more efficiently than any steam jet not so equipped.

Literature and test data may be obtained from the manufacturers.

The American-La France Fire Engine Company, Inc., Elmira, N. Y., announces the receipt of the following orders:

Buffalo, N. Y., 1 type 40 pumping engine; Hackensack, N. J., 1 type 31, 65-ft. aerial truck; New York, N. Y., 5 special pumping engines; U. S. Government, Naval Training Camp, Coddington Point, R. I., 1 40 combination; Engineering Depot, 1 75 chassis; Fairport, N. Y., 1 type B combination chem. eng. and hose car.

NEWS OF THE SOCIETIES

(*Continued from page 58*)

been fighting for" by wage conditions and health measures which will conserve the "manpower which now is recognized as the nation's greatest asset."

General education in sanitary matters as a means of preventing disease and promoting both public health and physical fitness was the keynote of the address. Public recognition of the health officer was discussed by Dr. Lee K. Frankel, New York. He presented statistics showing that of 417 cities 153 had full-time officers and 264 part-time officers, most of the former being in cities under 50,000. In the majority of cases no training in taking care of the public health is required of candidates for office.

Besides the six general sessions there were about twenty-five others held by the seven sections of the convention. Sanitary engineering questions, as well as bacteriological, were taken up.

Chlorination of the water supply of Chicago was described by John Ericson, city engineer, and in the discussion it was pointed out that one element of the success of this treatment is variation of the dosage in accordance with wind and weather conditions on the lake, as these conditions are found to influence directly the bacterial content of the water. While Chicago already has the remarkably low typhoid death rate of 1.7 per 100,000, it is expected that the figure for 1918 will be below 1.5.

Conditions at Milwaukee in regard to quality of the lake water were described by T. Chalkley Hatton. Treatment of Chicago sewage by dilution in the drainage canal was indorsed by C. D. Hill, engineer of the Board of Local Improvements, and Langdon Pearse outlined the experiments on preliminary treatment of sewage before its discharge into the channel.

Sanitary work at the shipbuilding yards was reviewed in a paper by Lieutenant-Colonel Philip S. Doane, director of health and sanitation for the United States Shipping Board. In the eleven yards operated by the board it was not difficult to carry out sanitary measures, but the other 160 yards work under contracts, none of which calls for specific sanitary equipment, and only a few of which provide for maintenance of sanitary and hygiene conditions. Thus the health department had to work diplomatically and in an advisory capacity, but in most cases the yards carried out the suggestions made. Interconnection of dual water systems for fire protection and drinking supply, with only a single gate valve for the protection of the latter, was a common trouble that has been almost entirely eliminated. Water supply, sewage disposal, food protection, toilets, fly and mosquito conditions were the principal centers of activity. Closely related to this subject was the mosquito control at Hog Island, described by B. F. Royer, acting state commissioner of health for Pennsylvania.

Housing work of the United States Shipping Board was described by Morris Knowles, chief engineer of the housing department of the board, who showed plans of various layouts and also photographs illustrating the types of structures employed. In the discussion the great extent and importance of the housing work carried on by different departments of the United States Government were mentioned by C. B. Ball, chief sanitary inspector, Chicago.

Recovery of grease and tankage from garbage has fallen off slightly under war conditions in spite of the educational work of the Food Administration. This was shown in a report prepared by Samuel A. Greeley, Chicago. Prices have increased from about five cents to fifteen cents per pound for grease and from $7 to $18 per ton for tankage.

"A Critical Study of the Bacterial Count in Water and Sewage," dealing with the probabilities of errors, was presented by Milton F. Stein, designing engineer, Division of Sanitary Engineering, Cleveland.

Indiana Engineering Society.

The thirty-ninth convention of the Indiana Engineering Society will be held at the Claypool Hotel, Indianapolis, January 23-25.

The opening session, on Thursday afternoon, January 23, will be marked by a number of important papers on highway engineering subjects. Following officers' and committees' reports John W. Mueller, consulting engineer, Richmond, Ind., will present the report of the Committee on Legislation, of which he is chairman. This report will cover proposed state road legislation, as well as the proposed civil service law governing city and county offices.

The papers to be presented at this session are: "Proposed Bills for County Surveyors," with discussion led by J. R. Gregory, county surveyor, Williamsport, and R. E. Gibbons, Terre Haute, Ind.; "The Concrete Road and Its Mission," C. D. Franks, Indianapolis, engineer, Portland Cement Association; "Roads and Highways"—two papers by prominent speakers; "Highway Engineering Work," Professor R. C. Yoeman, associate professor of highway engineering, Purdue University; "The Rational Method of Computing Storm Run-Off," Professor R. P. Wiley, Purdue University, Lafayette, Ind.

Thursday night's session will be devoted to the economic welfare of the engineer, and will be held jointly with the American Association of Engineers, Professor R. C Yoeman presiding. The following papers will be read: "The Engineer, His Problems and Opportunities," W. H. Finley, President A. A. E., President of N.-W. Railway Company, Chicago, Ill.; "The Need of Co-operation Among Engineers," W. C. Drayer, Secretary A. A. E., Chicago, Ill.; "Proposed Bill for Licensing Structural Engineers"; discussion led by H. O. Garman and W. H. Insley, Indianapolis.

Friday and Saturday sessions will be held in connection with the local section of the national mechanical, civil and electrical engineering societies. The papers to be read include the following: "Psychological Methods of Selection for Soldiers, Officers and Employees," Professor C. F. Harding, Purdue University; "Developments of the Governing Policies for Engineering Societies"; joint discussion with A. S. M. E. Section; discussion led by Professor Talbot, Urbana, Ill.; "The Year's Progress in Electrical Engineering in the Allied Fields"; report by Professor D. D. Ewing, Purdue University; "Electrical Pumps in Municipal Water Works," Professor D. D. Ewing, Purdue University; "Steam Plants in Indiana in Relation to Fuel Conservation," Professor Frank C. Wagner, Rose Polytechnic Institute, Terre Haute, Ind., administration engineer U. S. Fuel Administration of Indiana; discussion by George W. Hubley, administration engineer U. S. Fuel Administration, State of Kentucky; "The Fuel Administration and Public Utilities," Charles Brossman, Indianapolis, Ind., consulting engineer on public utility plants, U. S. Fuel Administration of Indiana; "Public Utilities in the War Period," H. O. Garman, chief engineer, Indiana Public Service Commission, Indianapolis; "Sanitation in National Army Camps," Samuel E. Greeley, sanitary engineer, Chicago, Ill.

The secretary of the society is Charles Brossman, 1503 Merchants' Bank Building, Indianapolis, Ind.

Municipal Journal

Volume XLVI NEW YORK, JANUARY 25, 1918 No. 4

HOUSING CONSTRUCTION AT CRADDOCK

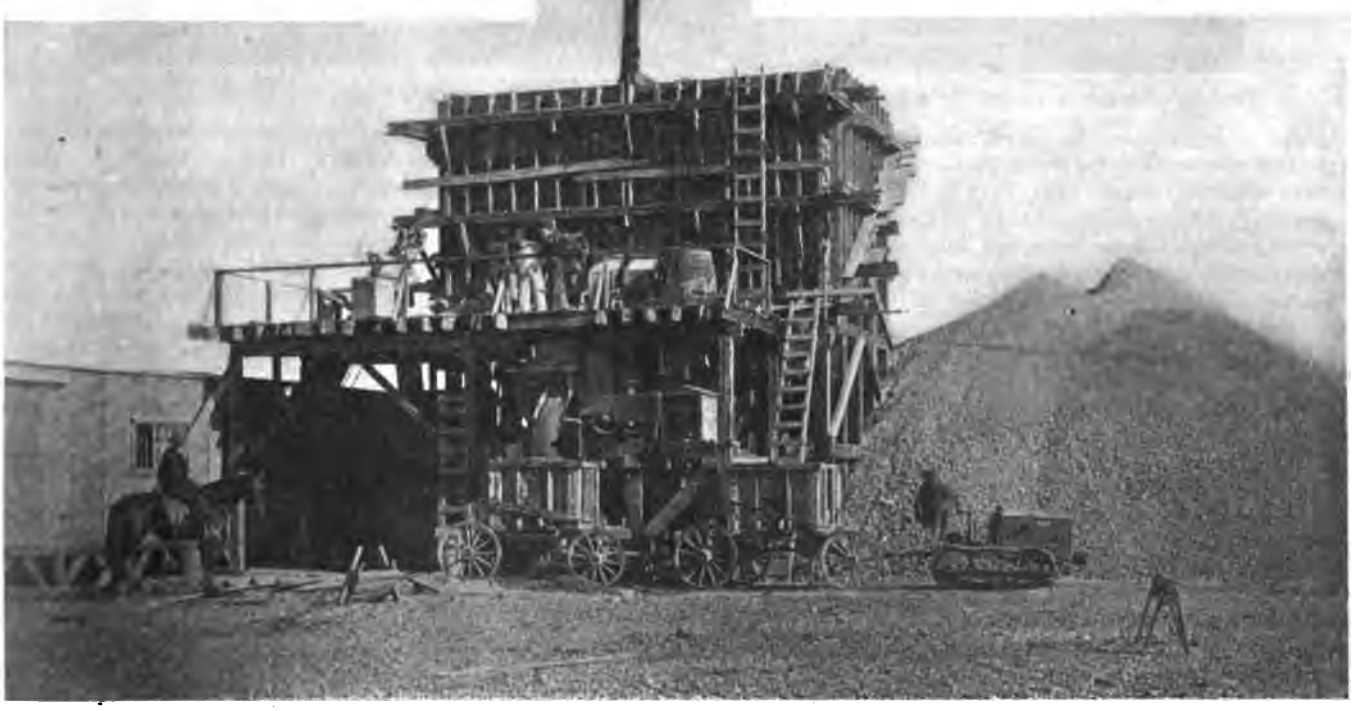
Building a Project Near the Portsmouth Navy Yard to Provide Homes for Five Thousand Workers—Distributing Railroad—Central Concrete Plant—Concrete Delivered by Tractors—Progress Clock.

On November 11, when the armistice was signed, the U. S. Housing Corporation had under construction, or at least under way, 89 projects for furnishing houses for war workers. Of these, 55 were at once abandoned, 14 were curtailed, and only 20 were continued as planned. Canceling of some of these for which had been estimated an expenditure of over seventeen million dollars was done at a loss of about four million; others totaling about five and a half million were canceled without loss; while the curtailing of the fourteen saved about six mlilion dollars.

Some of the projects were designed to fill not merely war needs, but peace ones as well. Among these is the one known as Cradock, Va., which is being built over the Portsmouth Navy Yard. It is estimated that the permanent post-war requirements of the Army and Navy in this vicinity will make permanently serviceable a large part of the original plan for housing five thousand people. Between May 1, 1917, and January 1, 1918, about 20,000 persons were brought to this section by the needs of the Navy Yard, the Naval Operating Base at Hampton Roads, the U. S. Magazine, the Pig Point Ordnance Stores, Tanners Creek General Stores, the Engineers' Depot at Norfolk and the N. & W. R. R pier.

The site of Cradock is an area of 450 acres of farm land, on Paradise Creek, and reached by the Virginian Railroad and the Gilmerton branch of the Virginia Railway & Power Co. The construction was let to the Hegeman-Harris Company of New York City, which on December 12th had twelve hundred men at work on 463 houses and the utilities. There are fifty distinct designs of houses, single and double, ranging in size from four to eight rooms. Provision is made for a town hall, post office, stores, etc., built around a town square. So far as possible, building operations have been so conducted as not to injure standing trees or require them to be cut down, all trees being boxed to prevent injury and fences being placed around important sections. In addition, young trees will be planted along boulevards, parkways, and streets to supplement present standing timber.

A boulevard system encircles the city, which intersects broad parkways running through the center of the city. The residence streets will be fifty feet wide, all curbed and drained. A complete sewer and



CENTRAL CONCRETE PLANT SERVING THE ENTIRE PROJECT.

PROGRESS CLOCK TELLS RATE OF PROGRESS.

water distributing system is provided, the main sewer being 30 inches diameter, and a 16-inch main bringing water from the Portsmouth pumping station. Fire hydrants are provided at each street intersection.

Engineering work on the site was begun on August 7, 1918. The engineering work has been in charge of Hill & Ferguson of New York. The general and architectural plans were prepared by George B. Post & Sons.

The contractors carefully planned their operations before starting work, and have adhered to the system adopted, although from time to time additional labor-saving devices have been put into use. Three miles of steam railroad, with switches and sidings, were used for distributing materials, so located as not to interfere with permanent construction and so planned that material is delivered near the spot where it is to be used. This railroad system connects with the Virginia Railroad. The main line runs through the center of the site and forms a complete return loop. An average of 30 freight cars of material was received daily, and the number has reached 58.

Supplementing the railroad, the contractors used numerous trucks, tractors and horse-drawn wagons. One novelty that was used extensively was the small caterpillar tractor, which was used for drawing plows, hauling concrete and loads of material over rough ground as well as on roads, and pulling down trees.

The temporary structures, most of which were built before the permanent work was begun, included a central office building, storage buildings, saw mill, barracks, and canteen and mess hall for white workers and others for the colored workers. The barracks are heated, and have running water and shower baths. In a "welfare office" records are kept of all the men on the job, and first aid to the injured is adequately provided for.

As a stimulant to speed, the contractors erected a tower on their office building on which was painted a large progress clock, the hands being painted red and black respectively. The black hand was set each day to indicate the state of completion that it had been estimated should have been reached, the red hand to indicate the point reached by the actual progress. This clock is visible from all parts of the work.

The foundations for the buildings were built of concrete, each house foundation taking on the average 10 cubic yards. Instead of using several small mixers and bringing the aggregate and cement to them, the contractors erected one central mixing plant, in the center of the grounds, one advantage of which was reduction in the number of laborers required. This plant has a capacity of 250 cubic yards a day. The mixer itself is elevated above the ground so as to discharge directly into carts or trailers. Above the mixer are the bins for aggregate, which are filled by derrick from piles of aggregate on the ground near by. On a level with the bottom of the bins and above the mixer is a working platform. By special bin outlets the aggregate is measured and discharged directly by gravity into the mixer. The cement is stored in a building alongside the mixer and is delivered to the working platform by a bag elevator. The plant is operated by electricity.

The concrete was delivered to the forms in carts that

A VIEW OF A PART OF THE WORKS SOON AFTER CONSTRUCTION BEGAN.

SMALL CATERPILLAR TRACTOR HAULING CONCRETE ACROSS FIELDS.

had inclined bottoms and discharged through a sliding door and short chute, each cart holding about a cubic yard. These carts were hauled by small "Cleveland" caterpillar tractors that looked little larger than toys, but could haul two carts each over a fair road at a speed considerably greater than that of a draft horse.

By December 12th ten million feet of lumber had been delivered on the job. A saw mill was used for cutting all frame timber, exterior and interior trim and other pieces, so that practically no hand sawing was necessary. This mill cut the lumber for twelve to fifteen houses a day. In handling the arriving lumber it was unloaded from the railroad cars onto temporary platforms, and from these loaded easily onto the motor trucks, thus avoiding the necessity of keeping either cars or trucks waiting, as is necessary a considerable part of the time when unloading cars directly onto trucks.

As an illustration of the speed attained, foundations for a group of seven apartment buildings, totaling 104 four-room apartments, were begun on October 23rd, and on November 10th one building was completed with plumbing, running water and electric lights installed and the apartments ready for occupancy; while all the others were practically completed the same day, so far as construction work is concerned, and turned over to the plasterers, plumbers and electricians. This group of apartments surrounds a well-wooded court for the use and pleasure of the tenants.

MUNICIPAL PEACE READJUSTMENT*

How American Cities Are Planning to Solve This Problem—Public Works Which Will Be Constructed—Opinions of Municipal Officials.

At the annual meeting of the conference at Newburgh last June President Stone was authorized to appoint a committee to study what New York State cities can do to help in the economic rehabilitation after the war, and to make recommendations not later than the next annual meeting. At that time it was the consensus of opinion that the committee would have all the year in which to make its study. The enemy of Democracy, however, collapsed much sooner than most of us anticipated. As a result America has had to face about and tackle readjustment problems at a much earlier date than it had expected it would. As soon as the armistice had been signed, therefore, the chairman of your committee requested the State Bureau of Municipal Information to seek the opinion and advice of the mayors of American cities about the work that municipalities should and can do to assist the nation and the state in a return to a peace basis.

From the replies the bureau received we have selected those from the mayors of fifty American cities, representing every section of the United States, and all sizes of municipalities. We believe that by presenting a summary of these replies we can best enlighten you on the manner in which American municipalities are planning to solve readjustment problems.

In its letter to the American mayors the bureau first asks what municipal readjustment plans the city had already adopted or was considering. Its second inquiry was as follows: "What, in your opinion, can and should American cities do to assist the nation and state in their readjustment work?"

Only a few cities replied that, because of limitations on their borrowing capacity or budgetary expenditures or because of serious financial problems confronting them, they will this year be able to undertake no extraordinary construction work. Following are the undertakings which the others either have already decided to carry out or are considering:

San Francisco.—City will spend $250,000 to improve Hetch Hetchy water supply and power system and municipal railway; $500,000 to be spent on unpaved and unaccepted streets; $3,000,000 for school and civic center buildings, and $500,000 on service construction.

San Jose.—Road and bridge construction.

Harrisburg.—Development of park, construction of bridge over railroad tracks, erection of million dollar memorial bridge, improving subway.

Wheeling.—Install filtration plant, build bridges and improve streets.

Canton.—Increase water supply and distribution system, build two main trunk sewers, improve streets, improve new territory.

Ft. Wayne.—Develop three new parks, track elevation work, pave many streets and build sidewalks and sewers.

Kingston.—Erect some small buildings, improve streets, parks and playgrounds and eliminate grade crossings.

Binghamton.—Large amount of paving and sewer work.

Worcester.—Street paving, girls' trade school, enlarge hospital, memorial auditorium, enlarge water reservoir.

Spokane.—Reopen public works propositions postponed on account of the war; build municipal auditorium and more efficient general public market.

Dayton.—Will spend $360,000 for street and sewer improvements and water works extension. May call special election to vote on $2,000,000 bond issue for public improvements.

Trenton.—Complete tuberculosis and general hospital, erection of venereal hospital and clinic headquarters, erect municipal sanitary station and public comfort station, complete municipal dock, construct warehouse and other structures co-related with Delaware river deepening project, acquire ground for public market center, erect soldiers' memorial either in the form of a monument or community hall, extend and improve public park system, extend lighting system, motorize fire department, extend sewers, repair and pave streets and extend water system.

Austin.—Complete sewage disposal plant and power dam.

Tulsa.—Reconstruct water works.

Davenport.—Extensive program for street paving and grading.

St. Louis.—Building projects, street paving, sewer construction, bridges and viaducts, grade crossing eliminations, parks and playgrounds, memorial municipal auditorium and convention hall; asking for bond issue of $22,000,000 for the work.

Oneonta.—Thorough and systematic study of progressive city planning with well defined objectives in view. This will include city government and city improvements, such as permanent street improvements, park development with recreation features, industrial advancement, sanitary housing and sewage disposal.

Lynchburg.—Street and sidewalk improvements, sewer construction, establishment of small parks and playgrounds and erection of a municipal building.

Easton.—Construct wharf, extend heat pipes, open and grade streets, street crossings, improve lighting system, parks and storm sewers and erect comfort station.

Cambridge.—Proceed with all necessary construction work possible that was postponed on account of the war.

Glen Cove.—Number houses and reconstruct sidewalks.

Lynn.—Street and sewerage improvement work.

Ogdensburg.—Street paving work.

Cedar Rapids.—River front improvement, construct large concrete bridge, resurfacing streets, suitable memorial for soldiers.

Buffalo.—Erection of intermediate school buildings, erection of municipal office building, municipal ownership of railway system, creek improvements, construction of sewers, street construction and reconstruction, construction of viaducts, river improvement, construction of docks, yard for all street repairs, construction of boulevard and roadway, improve water system, electrification of street lighting, construction of dock wall, reconstruction of bridges, street widening, street car facilities, comfort stations, filtration plant, by-product coke oven plant for production of gas.

New Rochelle.—Build public dock and new road and repave a number of streets.

Passaic.—Laying permanent pavements and repairing buildings.

Syracuse.—New school houses, improvement of sewer system, new street pavements, creek improvement and sewage disposal plant.

*Report to January 22d meeting of Conference of Mayors and Other City Officials of the State of New York, by Mark I. Koon, mayor of Auburn, chairman of Committee on Economic Rehabilitation after the War.

Lorain.—Enlargement of water works plant and extension of system, improvement of park system, establishment of playgrounds, paving of streets, memorial hospital.

Cincinnati.—Building in new quarters and reconstructing considerably in old quarters.

Muskogee.—Improve water works, build hospital and improve streets.

Pittsburgh.—Improvements of various kinds.

Cleveland.—Construction of water reservoir, filtration plant and pumping station, installation of water mains, extension of light and heat, new bath houses, recreation pier, wholesale farmers' market and warehouse, swimming pools, waterway improvements, dance hall, boat houses, golf club house, city park, paving and sewering, new traffic laws, garbage collection sub-stations, straightening of river, enlarging city hospital and tuberculosis sanitarium, construction of children's tuberculosis division and girls' home at city farm, enlargement of correction farm, construction of civic center, new engine houses.

Seattle.—Building a hydro-electric power plant, addition to water system, and many street improvements.

A study of these reports shows that the slogan of American cities this year will be "progress." Almost every city is planning to proceed with construction work postponed on account of the war, and many in addition will initiate and make new public improvements. Many cities are preparing to erect memorials, and it is a noticeable fact that most of these will be memorials of a substantial character that will perpetuate not only the deeds of our heroes, but also the ideals for which they fought. Another important part which the American city is planning to take in the solution of readjustment problems is that of the social welfare. It is encouraging to note the number of municipalities which are awakening to the importance of community social service work. The problems of food supply, transportation, health, public safety, housing and education are also included in the programs of several cities. There is every indication that the greatest progress in their history will be made by American cities within the next few years.

The committee has selected the following opinions to indicate what American city officials believe municipalities should do to assist the nation and state in a return to a peace basis:

Mayor Galvin of Cincinnati.—"The opinion of the administration is that American cities should, when opportunity arises, do all things possible for the Nation and State in the line of reconstruction, or in any other way. Really, we are all one, whether we live in one part of the nation or another. Our right to travel and enjoy that which is about us, really makes for two phases of citizenship—the local and the non-resident. There is inherent in each of us a certain sense of responsibility for the maintenance of good governmental substance and functions, whether divided into municipal, state or national defense."

City Manager W. C. Bailey, San Jose, Cal.—"I thoroughly believe that all possible work should be provided at this time so that we can absorb all unoccupied labor."

Mayor Palmer Canfield, Jr., Kingston, N. Y.—"It is my opinion that cities can assist in the reconstruction work by carrying on to the fullest extent the character of the work above outlined (public work) and also by the maintenance of real public markets where farm and poultry produce and fruit will be received and paid for at market prices which will tend to cause the farming districts to be developed to a greater extent and also cause unused farm lands to be utilized."

City Engineer W. Earl Weller, Binghamton, N. Y.—"It is my opinion that the cities should assist the state and Federal Government in taking up the slack which is bound to come in the labor situation. This assistance can be most advantageously given by proceeding with public works."

Mayor Samuel A. Carlson, Jamestown, N. Y.—"The American cities should be empowered to undertake any project in the way of utility service which will reduce rates and improve service. All the constitutional and taxation restrictions which are now a handicap upon cities should be removed. The city governments acting in a representative capacity should petition the State and National Government to immediately inauguarate reconstruction reforms, such as minimum wage standards, abolition of child labor, pension provision for old age, and procuring available lands for returning soldiers for agricultural purposes, a universal reduction in the hours of labor to prevent unemployment, the abrogation of all restrictions which prevent the freedom of conscience and public expression, in order that our nation may be free from the evils of anarchical violence which is the outgrowth of autocratic repressive measures carried out by tyrannical governments of the old world. The traditional polities of freedom of speech should be safeguarded in order that we may preserve American Institutions."

First Deputy City Clerk E. D. Miller, Providence, R. I.—"A joint special committee of City Council has just been appointed to consider and recommend relative to all branches of the subject."

Mayor Charles M. Fassett, Spokane, Wash.—"While I feel that the great civic progress which will come from the successful close of the war must be largely the result of national rather than of municipal activities, yet I am sure that municipalities can do a great deal, largely along the line of city planning proposals which most cities have been considering for some time. Every city should see to it that the new time shall mean better living conditions for its citizens and make an earnest and unselfish effort to promote the health, happiness and well-being of its people."

City Manager J. E. Barlow, Dayton, O.—"We believe it absolutely advisable to stop making war materials of little or no use after the war and turn the labor and material into work that will be of permanent value. It is likely that better prices can be secured later which may make private capital hesitate and so public improvements should logically be undertaken at once to bridge over this uncertain period."

Mayor Frederick W. Donnelly, Trenton, N. J.—"I believe it is highly essential from an economic standpoint that as much public work be released as is possible within the next few months during the time that the country is passing from a stage of abnormal war-work employment to normal business and industrial conditions. In order that there may be plenty of employment during this interim of readjustment, I believe that the cities, the various States, and the Federal Government itself should give impetus to as much public construction work as is possible. In order that such a program of construction may be unhampered in any form, I would favor the abolition immediately of the Capital Issues Committee and any other restrictive agency that would have the power to hold up or hamper this reconstruction program. * * * Every municipality should co-operate in endeavoring to bring economic and industrial conditions to anormal stage to the end that the reconstruction period following the great war will make a new era in national achievement and prosperity."

Mayor A. P. Wooldridge, Austin, Texas.—"My opinion is that the municipalities of the country should start and carry out as many public works improvements during the next few years as their needs urgently require and as they can advantageously finance."

Mayor Charles H. Hubbard, Tulsa, Okla.—"We feel that all of the cities of America should be interested in the readjustment and the demobilization of our great army into the producing class at a profit. These young men are full of life, vigor and energy, and they are ambitious and can be placed in the industrial pursuits wherein and whereby their ambitions can be satisfied and their ideals worked out for the betterment of themselves and the community of which they form a part.

"The municipalities, we anticipate, will have to take a broader view of this matter than will be found within the confines or boundary lines of their respective municipal governments. They will have to aid the county and the state in placing these men in the mine, factory and farm, each to the place where he can do the best, and I feel that the greatest of the questions to be determined is not so much a question of employment of idle labor as it is a question of the ability to pay.

"We feel, however, the urgent necessity of taking care of all of the idle labor in the community, for only in this way, as we view it, can we avoid the dangers that follow in the wake of the I. W. W.'s or the Bolsheviki."

Mayor C. M. Littleton, Davenport, Ia.—"I am in favor of going so far as to bond the city in order to furnish work for workingmen during this period of reconstruction * * * It is our duty to see that the men have jobs and this is the only way that the city can do it."

President, Board of Public Service, E. R. Kinsey, St. Louis, Mo.—"A great reconstrution already has taken place. A reconstruction of the spirit of co-operation of the people which has brought about a unity of purpose, and a co-operation in action in the prosecution of the war far beyond what any one thought us capable of attaining.

"Is this habit of co-operation to be alldwed to die out now that the war is over? It seems to us in St. Louis that the utmost efforts should be made to foster and maintain this spirit in working out problems for the common good in municipalities and states."

Mayor Royston Jester, Jr., Lynchburg, Va.—"It is my opinion

that the American cities should begin to make improvements during the early part of the coming year so as to assist the Federal Government in solving some of the problems which will necessarily arise during the reconstruction period."

Mayor James E. Burns, Glen Cove, N. Y.—"Our opinion in assisting the state and nation in its reconstruction work, is to furnish employment for our boys immediately upon their return from war service, and to see that they are given positions. When any municipal work is going on, it will be our aim to give our returned soldier and sailor boys preference in that sort of employment, and also will act upon suggestions from our state or nation in order to co-operate with them along readjustment lines."

Mayor J. F. Rall, Cedar Rapids, Ia.—"In my opinion the construction of memorials on the late war should be in the form of buildings or other public works of general utility. In this connection the large concrete bridge mentioned above has been urged as a suitable structure with which to incorporate something of this kind. This community is also in need of a municipal building which might also be developed along this same line with memorial features."

Mayor James Saul, Dubuque, Ia.—"Closer co-operation is needed before anything can be accomplished."

Mayor Frederick H. Waldorf, New Rochelle, N. Y.—"It is our duty as a municipality to commence work so as to set an example for private interests, and give our young men employment while they are looking around to take permanent positions."

Mayor Walter R. Stone, Syracuse, N. Y.—"I think the municipalities should proceed as soon as possible with all of the work deferred in the past two years, provided the Capital Issues Committee does not intervene to prevent the acquisition of necessary funds."

With this presentation of the consensus of opinion of American cities your committee believes it has pointed the way for the cities of New York State to aid in the readjustment problems. The labor problem is the most pressing at this time. The cities, by carrying out as many public improvements as their needs require and they can advantageously finance, can help greatly to prevent unemployment while our industries are readjusting themselves to peace conditions. In planning these improvements, however, every city administration should bear in mind the advice of the mayor of Spokane: "Every city should see to it that the new time shall mean better living conditions for its citizens, and make an earnest and unselfish effort to promote the health, happiness and well-being of its citizens."

PAVING IN WINNETKA.

In his annual report published in 1918, H. L. Woolhiser, business manager of the village of Winnetka, Ill., described the method of improving the macadam streets of the village. All of these were resurfaced with tarvia.

"The first step was to make a personal canvass of property owners on streets selected for resurfacing. A considerable portion of the frontage was secured in this way, at a cost of 1 cent per front foot signed. Out-of-town owners, and persons whose signatures could not be obtained otherwise, were mailed a form letter over the signature of the village president, setting forth the nature of the work proposed and explaining the economies to be secured by a payment of 15 cents a front foot, rather than $4.00 or $5.00 a front foot through special assessment proceedings for a permanent-base pavement. As a result of this campaign, about 85 per cent of the total frontage was signed.

"Before the construction season closed, we were able to complete 5.8 miles of this work, the total cost for which amounted to $18,986.07. The average cost per running foot was 62 cents, or 37 cents per front foot of abutting property. Of the total cost above stated, $6,284.10 was subscribed by property owners, or approximately 33 per cent. The net cost to the village was about $13,000.00, as compared with $6,000.00 for the previous year.

"As a result of the season's work, the streets covered are in first class condition and, where traffic is not too heavy, will not require resurfacing for at least two seasons. It is expected that on streets which receive heavy automobile traffic, a light application of tarvia should be made each season.

"In conjunction with the policy of resurfacing, there was also put into operation last year a patrol system for periodically inspecting and promptly repairing defects on tarvia macadam streets. This work served to maintain the resurfaced streets in 100 per cent condition, and showed a considerable decrease in maintenance costs as well."

WATERWORKS OPERATION RESERVOIR MAINTENANCE.

Forestry on Catchment Areas—The Advantages, Methods and Costs—Some Figures and Results from Practice.

FORESTRY.

Most waterworks companies or departments that obtain their supplies from surface reservoirs own more or less land around such reservoirs. It becomes a question, then, what treatment of this land will be best from all points of view.

The most important consideration is the effect of the treatment upon the quantity and quality of the water supply itself; but aside from this, there are possibilities of securing an income from the land, and of so treating it as to give pleasure to the citizens, either as a part of the scenery or as a recreation or outing area. It is believed that all of these considerations point to the advisability of scientific forestry as an established feature of the maintenance of the catchment area.

Most of the forestry which has been conducted by water companies or departments has been in the northern states, especially in New England, although it is by no means confined to this locality. For instance, the St. Paul water commissioners have for some years been reforesting the watershed of Lake Vadnais under the direction of the College of Forestry of the University of Minnesota. In New England forestry work has been undertaken by the water departments of Fall River, Westfield, Holyoke, Fitchburgh, Needham, Milford, Pittsfield, New Britain, New Haven, Hartford, Nashua and many others.

As has been stated before, trees around the reservoir help to prevent evaporation from water and land surfaces by diminishing the velocity of the winds that blow across it. They also cool the atmosphere by the shading of the ground and by the evaporation from the foliage, which slightly decreases the temperature of the water, making it more palatable; and this coolness also lessens evaporation. The leaves falling upon the ground form a mat which protects the soil from erosion, while the roots help to hold the soil in place.

An objectionable feature where the land immediately around the reservoir contains deciduous trees is the blowing of leaves into the reservoir. In the northern states this can be prevented by planting coniferous trees, the leaves of which are not blown about by the wind. These trees offer the further advantage that the foliage remains all winter, and in spring prevents the thawing of the snow by sun, thus prolonging the run-off from the catchment area at a time when the reservoir is filled by spring freshets, thus increasing the amount of run-off stored. Where deciduous trees are already found growing around the reservoir, the leaves can be prevented from reaching the water by planting along the shore a continuous screen of arbor vitae or some other bush which furnishes a dense hedge from the ground up and does not itself shed an

abundance of leaves. Such a hedge will collect behind it a very large percentage of the leaves blowing from the trees. For protecting the Wachusett reservoir of the (Boston) Metropolitan waterworks, a continuous compact screen of arbor vitae was set out along thirty-two miles of the shore. Two rows of trees, the rows two feet apart and the trees three feet apart in each row, were set out and have grown to a height of twelve feet or more and form a solid bank which catches the foliage from the hardwood trees.

If there are no trees on the land it will, unless unusually poor or arid, grow up to brush or wild vegetation of some kind unless put under cultivation. Since the use on the land of fertilizer, which may be washed into the reservoir, is not to be considered, the only crop that can be raised would appear to be hay, and a number of water companies and departments use considerable areas of their catchment areas in this way. In time, however, the land will run out unless fertilized, and it will no longer be profitable to attempt to grow hay upon it. The alternative then, even with this land, must be to allow it to run to brush, or to stimulate the growth of trees upon it. Land so allowed to run to waste is truly waste land and, while in the newer sections of the country, where there is so much uncultivated land, this may not furnish any argument, the fact remains that by planting such area to trees it may be possible to insure a future income from the land, at the same time adding to its sightliness and the possibility of its use as a recreation ground.

If forestry would be profitable for any one, it would seem to be so for a water department, since it already possesses land which can be used for no other purpose and on which as a rule it pays no taxes; also because a municipality has a longer life than an individual and can better afford to wait a number of years for returns upon its investments. It was reported a few months ago that the New Haven water company, in the nine years previous, had obtained $37,000 for the wood cut from its catchment area, and from this had paid out all of its expenditures for forestry work and forestry improvement, and had in addition over $8,000 credited to the forestry account. It is the fixed policy of the New Haven company to plant about 250,000 trees a year. The comparatively small city of New Britain has purchased 37 acres of land in the six townships into which its catchment area extends and is systematically clearing this of all deadwood and brush. In 1918 it reported that a large part of the land was already well covered with large, healthy trees, furnishing an excellent protection to the watershed and that all open land is to be planted with pines and other varieties, 20,000 trees already having been set out and 30,000 having been purchased. The expenditure on forestry work during the fiscal year of 1917-1918 was $248.20, while there was received from the sale of wood $456. The wood so sold was merely that obtained by clearing off the land and is no indication of what will be received from the timber which is now being grown.

A few years ago the state forester of Massachusetts, F. W. Rane, made a calculation of the profits from the forestry conducted by the Metropolitan Water Board of that state. The board had planted 1,200 acres of land with pine and hardwoods at an average cost of $20 an acre. During the first ten years following they had to spend $6 an acre for improvement cutting and about 25 cents per acre per year for fire patrol. It was believed that these trees will yield 46,500 feet board measure per acre when fifty years old, the value of which at that time was $465, but will probably be considerably more than this when they are cut. Using the value of $465, however, and allowing for interest compounded on the forestry costs, Mr. Rane calculated a net balance of $290 profit per acre.

Another advantage of forestry is that a large part of the work, including the clearing out of the undesirable timber, planting new trees and the cutting of full-grown timber, can be done in the winter time when the men who were on the payroll during the summer must either be discharged or kept at unprofitable work, the waterworks force thus being retained throughout the year at profitable employment. It is suggested that if it is not desired to retain them at a salary, some of them can be employed at cutting hardwood by the cord. Since the catchment areas are generally near cities, there is generally no difficulty in finding a market for the wood.

In a few cases water power has been available on the stream below the intake or dam sufficient for the running of a sawmill during high water, and it has been found feasible and profitable to locate sawmills at such points, where employes of the waterworks can saw into lumber trees cut on the catchment area. In most cases, however, it has seemed to be preferable to sell the lumber to sawmills, and some companies or departments have preferred to sell it standing, claiming that their employes, inexperienced as lumbermen, could not earn their wages at lumbering.

For northern sections, at least, soft wood is much preferred to hard wood for forestry purposes. Hard-wood land does not retain water so well as soft-wood land, and the evergreen soft-wood trees retain the snow on the ground longer, keep the air under them cooler in summer, the mat of needles on the ground keeps the frost out of the soil, and not so much moisture is evaporated from their foliage as from hardwood trees. In New England the white pine seems to be considered the most desirable tree for this purpose, although a few years ago the weevil did considerable damage to these trees in certain sections. In general, however, the white pine is not attacked by pests. It grows vigorously in light, sandy soil and gives valuable timber. After the trouble with the attack of the weevil upon white pine, a number of cities began planting red pine, which is said not to be attacked by it. Scotch pine was planted by New York on poor soil on its Croton watershed. It is not so valuable commercially, but it is hardy and has a longer tap root. The Norway spruce does best in fairly good soil, but grows better than most coniferous trees in moist grounds and is, in fact, noted for its hardness and adaptability to any soil.

In planting trees as a commercial enterprise, especially pine and similar trees, close planting is recommended in order to secure straight stems and a small number of knots. Where land is open, pines and other conifers are planted about six feet apart.

It will not usually pay to clear off land covered with second growth or brush, but the young trees on such land may be permitted to grow until large enough to cut for fuel, and when so cut the area can be planted to conifers. The sale of the scrub wood for fuel will usually pay for cutting it and clearing the land. Where areas are already growing to good hardwood timber, these can be thinned out periodically and kept in a healthy condition, the material so cut paying for the cost of removal. All over-mature timber and trees of no considerable value as lumber should be cut out as rapidly as possible and the areas so cleared planted to pines or other wood of greater value. All of this will of course take time, but forestry is a matter of time and cannot be hurried. Meantime the hardwood growths can be under-planted with white pine seedlings two or three years before they are to be cut, so that when they are removed a pine plantation has already been started.

The whole matter of planting should be systemized from the beginning. First, a survey should be made of the entire catchment area, by which is ascertained the kind and condition of all trees or brush growing upon the land, and the nature of the soil in its bearing upon the kind of tree most suitable for raising upon it. The aim should be to gradually bring the entire area to such condition that there will be a continuous succession of trees of commercial value coming on at all times, a certain number of which will each year reach the size most profitable for cutting and be replaced by others of younger growth. It is considered profitable to cut pine trees when they are forty years old, but it will generally be more so to wait until they are fifty years. At fifty years of age a pine should be 14 inches in diameter and 60 feet high and produce 46,000 board feet per acre.

Trees to be used in reforesting can be obtained from state forestry departments in a number of states, either at no cost except transportation, or at comparatively small cost. A number of water departments and companies, however, raise their own seedlings. About a year ago the superintendent of the Metropolitan Waterworks reported that they had two large nurseries containing about 400,000 pine trees, half of which would be ready to plant in the spring of 1918. In the spring of 1908 29,300 three-year-old white pine seedlings, which had been one year in seed beds and two years in the transplant beds, were planted six feet apart. The cost of raising these in the nursery had been $205, planting in the field had been $230, the first protective clearing three years later cost $330, and a second protective clearing four years after that cost $304. These trees were planted on land which had been cleared of very rough scrub, sprout and weed grass at a cost of about $14 an acre, about half of which was recovered by the sale of cord wood. This gave a total cost per acre for trees ten years old of $40 or a little over four cents per tree. Another planting in a pasture land where there was no preliminary clearing cost also about four cents per tree, including protective clearing. At Kensico reservoir, New York City planted over 800 acres with three-year-old transplants which cost $4.41 per thousand plus 43 cents freight. Labor in handling for inspection, teaming and planting cost $6.30 per thousand, and supervision 74 cents, giving a total cost per thousand of $12.38. Toward the end of the season the men had become sufficiently expert to plant about 500 trees per day per man. In another case the New York Water Board purchased three-year-old transplants and cultivated them for three years in a nursery, when they were from three to five feet high, and their cost then was about $60.52 a thousand; 26,000 of which trees were planted in permanent location at a cost of $73.91 per thousand for all labor, supervision, transportation, etc., giving a total cost for the six-year-old trees of 13½ cents each. These New York costs do not include clearing. In another instance trees were set out by contract at a little less than $26 an acre, 1,250 trees to the acre, that were guaranteed to grow, and the contractor is said to have made a profit.

The young trees having been planted, they must be protected from fire and from insect pest as far as possible. While they are young the land around them is likely to grow to grass or weeds and these cannot be cut without destroying the young trees also. When the grass dies in the fall and dries, the danger of its being set afire is a more or less serious one, and it is desirable to have guards patroling the area at all times, but especially on Sundays and holidays. In order to prevent the spread of fire either in the growth around the young trees or in the matured trees, it is very desirable to furnish fire breaks if the woods cover any considerable area. In a number of cases these breaks serve the additional purpose of acting as roads for giving access to all parts of the catchment area. For grown or half-grown trees such fire break to be effective should be forty or fifty feet wide, and all vegetation should be cut from it every fall and burned in piles under supervision. No tops or trimmings of trees should be allowed to collect at any point on the area, but all should be piled and burned or hauled from the area and otherwise disposed of.

In the matter of insects, little can be done where the trees are numbered by the tens of thousands except to endeavor to select varieties which are least subject to attack by insects and also clear out any individual trees of varieties subject to such attack, since many insects will pass from trees which seem to be their natural choice to trees of other species if they are in the immediate vicinity.

FRENCH ROADS AND THE WAR.

Transportation by Truck for the American Army Has Made Necessary Resurfacing Hundreds of Miles of Road—Equipment and Men Needed.

By E. A. KINGSLEY.*

From August, 1914, until the Spring of 1917, the first two and one-half years of the great war, practically all of the energy of the belligerent nations was expended in the north of France and Belgium. A line drawn west from Nancy, through the southern boundary of Paris, to the coast, would represent nearly the southern boundary of all the activities.

The British troops were trained in Great Britain and then sent to France. French troops trained in the south of France were transported by rail to the "zone des armees." Colonial troops were landed as near to the scene of conflict as possible and hurried to the front. In the whole of central and southern France, conditions were not materially changed. Excepting for the scarcity of men and the predominence of men in uniform, one would hardly know that a war was on.

And even north of the imaginary Nancy-Paris line, most of the transportation was by rail. Germany had stolen thousands of the best French and Belgian locomotives and tens of thousands of their cars. But travel and shipments, excepting for military purposes, were almost suspended. Consequently the loss to Germany was not so keenly felt at that time.

After the United States entered the war in 1917, conditions began to change. In the summer, troops began to arrive and before winter central and southern France was given over to the United States Army. Literally it became America.

Then came transportation troubles. From the base ports to the front extended railway lines of communication approximately 600 miles in length. But the railways could not cope with the problem of hauling troops, equipment and provisions. Cars were not to be had in sufficient numbers and the railroad yards were not able to handle the trains fast enough to keep the ports clear. Immense storage depots had been established and were being stocked at a number of points. From these, in every direction, went out daily, equipment, material and subsistance supplies.

Army officials had early foreseen the difficulties. They had also knowledge of French road conditions and thousands of automobiles and trucks had been ordered. In addition to the already over-crowded railroads, auto and truck lines of communication were established from the base ports through the big intermediate section to the

*Major of Engineers, A. E. F.

front. During the year 1918 thousands of trucks and cars operated over these French roads and millions of tons of American freight have been transported. Had it not been for the wonderful French roads, the first battle of the Marne would never have been fought. Instead, the Kaiser would have dined, as he had planned ahead, in Paris. And the immense German flag which was specially made for the purpose would have floated to the breeze from the great Eiffel tower. Only because of the French roads, too, was America able to keep such a wonderfully big army so far away from home.

Most of the roads of France are of the waterbound macadam type, limestone predominating in their makeup. Near the larger cities and in the cities and towns considerable "pavee" or stone block has been used. In more recent years, quite a little tar surface work has been done.

The upkeep of the roads has been almost entirely hand maintenance. Even the stone has been very largely broken by hand. With the call to arms, this system became difficult to operate on account of labor shortage. Maintenance, therefore, has been confined almost entirely to keeping the drainage ditches open and the dangerously bad holes repaired.

During the first few months of 1918 the roads used by the American forces were in almost perfect condition. During the summer the increasing traffic and lack of maintenance began to tell on the road surfaces. By the end of the year the main lines used were badly pitted and in many places very rough. The surfaces are well worn and hundreds of miles of macadam must be re-surfaced.

Practically no work has been done on the tar-surfaced roads during the war. Tar products have been very scarce, and as the roads stood the traffic quite well, no apparent effort was made to maintain them. In a few instances they have broken some and begun to ravel. But as a general thing they are in fair condition.

Stone block surfaces are all laid on a sand foundation and continuous traffic has made them very rough. Blocks have been difficult to obtain, so that repairs have been almost entirely neglected.

The proposition confronting the French engineers now is where to get the labor and equipment necessary to do such an immense amount of work. Before the war France was a country much frequented by tourists. After the war it will be much more so, both because of the things to be seen and because of the many Americans who will want to visit France in peace times. The magnificent roads of France were known the world over. Motoring was a pleasure. It is now up to the engineers to repair, as quickly as possible, the damage done and replace the roads as they were before the war.

To rebuild the many hundreds of miles of roads will require money, time and much work. Most of the equipment used in the various departments has been taken to the front. A great deal of it, of course, has been damaged beyond repair, destroyed or worn out. All this must be replaced. Then, too, new methods must be adopted. The macadam roads are not suited to continuous auto traffic. It is very probable that other than waterbound macadam will now come into more general use. In fact tar-surfaced work was coming into quite general use when the war temporarily put an end to it. As in America, labor-saving devices and machinery and modern road construction methods will supersede the older order.

The entire road system, including the stone quarries, has been mobilized during the war. Most of the department engineers have been army officers. The chief of the road service in Paris has been the man in absolute control. American road engineers will remember him as M. Mahieu at the International Congress. He is now Col. Mahieu, "Inspector General des Ponts et Chaussees, Chef du Service des Routes Militaires." The colonel has been one busy man. It was his job to have to shoulder all of the burdens in connection with both civil and military roads, and to supply material and equipment for them.

But another big problem is now before him. Largely upon his judgment must rest the decision as to methods and means to be adopted. It is fortunate indeed that France has as big a man as Colonel Mahieu at the head of the "Service des Routes." Fortunate indeed, too, that he is a man of knowledge and experience.

TREATMENT AND DISPOSAL OF CREAMERY WASTES.*

Settling Tank and Sand Bed Designed and Tested by United States Public Health Service Gives Satisfactory Results.

By EARLE B. PHELPS.†

An experimental investigation of the treatment and disposal of creamery wastes was carried out during the years 1916-17 by the United States Public Health Service, cooperating with the Dairy Division, Bureau of Animal Industry, United States Department of Agriculture. This investigation was carried out at the plant of the demonstration creamery of the Dairy Division at Grove City, Pa. It was begun in October, 1915, but owing to difficulties of construction and necessity for remodeling, the actual satisfactory operation of the plant was delayed until May, 1916. It was discontinued at the end of October, 1917.

This creamery is operated under the supervision of the Dairy Division of the Department of Agriculture, and the business consists mainly of butter making. Some cottage cheese and casein are made, and other experimental work is carried on by the government, but the wastes treated consisted essentially of those from making butter. The milk is delivered by the farmers to the creamery, where it is separated, most of the skimmed milk going back to the farmers. No skimmed milk or buttermilk goes into the sewer; in fact, nothing goes into the sewer that contains any product in amounts that can be utilized as food for either man or animals.

The wastes that were treated consisted of those from washing cans and cleaning and rinsing the churns, together with a small amount of milk, cream and buttermilk that was spilled on the floors. The water used for condensing and cooling purposes and all exhaust steam were discharged into a separate sewer direct to the creek and were not treated with the other wastes from the creamery.

The experimental disposal plant consisted of a septic tank, an Imhoff tank, and two sand filters. Difficulties were had with the Imhoff tank, owing to imperfect construction work and leakage, leading to a considerable odor about the plant, so that this tank was not actually used during the investigation.

*From "Public Health Reports" of the U. S. Public Health Service. This investigation was in immediate charge of Sanitary Engineer H. B. Hommon, United States Public Health Service, who is responsible for its general plan and direction. He was assisted in the design and construction by Sanitary Engineer H. R. Crohurst and, during the period of operation, by Sanitary Chemist H. P. Corson, in resident charge. L. A. Rogers, bacteriologist, in charge of Research Laboratories, Dairy Division, cooperated throughout and lent helpful assistance. The work of preparation of a complete report was interrupted by the advent of the war, and Mr. Hommon is now serving in France as a captain in the Sanitary Corps, United States Army.

†Professor of Chemistry, Hygienic Laboratory, United States Public Health Service.

In May, 1916, the plant was put in operation, the sand filter being operated at a nominal rate of 25,000 gallons per acre per day, and the septic tank on the basis of a 12-hour storage period. The results of the operation were excellent almost from the start. During July the nominal rate of filtration was gradually increased to approximately 70,000 gallons per acre per day, at about which point it was maintained throughout the investigation. With the advent of cold weather a noticeable reduction occurred in the degree of nitrification, and a somewhat less marked effect was shown by the relative stability and oxygen demand values. The degree of purification was always satisfactory for discharge into a comparatively small volume of diluting water in cold weather, and the spring of 1917 brought with it increased biological activity and resulting improvement in quality of the effluent.

A noticeable and quite unexpected result was the complete neutralization of the characteristic acidity of the settled wastes, the average values for 18 months being 226 parts per million of acidity in the settled waste and 356 parts per million of bicarbonate alkalinity in the filter effluent. As the sand used was clean quartz sand, this change can be explained only as the result of biological activity. The accompanying tables, I and II, give the average analytical results, by months of the raw and settled waste and of the filter effluent, together with rates of operation:

The results of this investigation indicate the entire feasibility of satisfactorily treating creamery wastes. The investigation has been in no sense exhaustive, and, in particular, the advantages of Imhoff tank treatment in place of plain sedimentation have not been investigated. It has been demonstrated, however, that plain sedimentation is a satisfactory tank treatment preliminary to sand filtration, and that, with the following specifications, a disposal plant may readily be designed for satisfactory treatment of creamery wastes.

The settling tank should have a net capacity of about one day's output of the creamery. It should have one or more hopper bottoms with side slopes of 45 degrees and a sludge outlet pipe running nearly to the bottom. The total depth from water line to sludge outlet should be about 12 feet. There should be a vertical bottom baffle, extending 3 feet above the upper edge between each two

TABLE I.—Monthly averages of analyses of creamery waste, before and after treatment in a septic tank, showing removal of certain constituents.

(Analytical values in parts per million.)

Date.	Suspended solids. Untreated waste.	Suspended solids. Tank effluent.	Suspended solids. Removed. Per Cent.	Organic nitrogen. Untreated waste.	Organic nitrogen. Tank effluent.	Organic nitrogen. Removed. Per Cent.	Oxygen consumed. Untreated waste.	Oxygen consumed. Tank effluent.	Oxygen consumed. Removed. Per Cent.	Acidity. Untreated waste.	Acidity. Tank effluent.
1916.											
May	552	237	57	182	106	42	2,195	1,402	36	120	634
June	333	230	31	132	115	13	1,082	429	60	131	466
July	290	249	14	76	55	28	599	232	61	...	191
August	460	276	40	76	57	25	630	236	63	...	166
September	538	329	39	98	44	55	879	315	64	...	239
October	562	278	51	58	35	40	487	182	63	...	40
November	833	271	67	106	46	57	767	201	74	236	244
December	577	325	43	84	41	51	717	216	70	132	143
1917.											
January	567	306	46	95	53	44	578	215	63	116	141
February	601	289	52	106	44	58	802	258	68	...	138
March	1,114	515	54	122	51	58	1,285	275	79	220	141
April	916	566	38	78	45	42	757	240	68	32	40
May	525	250	52	66	34	48	762	257	66	...	184
June	531	280	47	62	42	32	628	243	61	70	210
July	380	219	43	44	34	23	816	215	74	153	376
August	400	214	47	34	27	20	468	153	67	125	160
September	360	233	35	67	37	45	716	208	71	220	198
October	386	182	53	72	56	22	715	222	69	185	323
Weighted, average	517	279	46	84	50	40	782	283	64	153	226

TABLE II.—Monthly averages of analyses of creamery waste, after treatment in a septic tank and through a sand filter, showing removal of certain constituents.

(Analytical values in parts per million.)

Date.	Suspended solids. Filter effluent.	Suspended solids. Removed.[1]	Organic nitrogen. Filter effluent.	Organic nitrogen. Removed.[1]	Oxygen consumed. Filter effluent.	Oxygen consumed. Removed.[1]	Nitrate.	Dissolved oxygen.	Alkalinity.	Relative stability.	Rate of filtration, g.a.d.
1916.		Per Cent.		Per Cent.		Per Cent.					
May	16	97.1	7.33	96.0	50.0	97.7	21.4	1.8	282	78	25,000
June	8	97.6	13.65	89.7	60.0	94.5	103.0	2.3	161	95	24,900
July	13	95.5	1.12	98.5	29.0	95.2	43.9	1.8	304	94	46,500
August	7	98.5	1.20	98.4	10.5	98.3	19.3	3.2	344	88	72,800
September	5	99.1	.27	99.7	10.1	98.9	11.5	2.9	418	79	71,100
October	16	97.2	.63	98.9	8.8	98.2	12.5	6.9	340	95	67,400
November	17	98.0	1.22	98.8	9.5	98.8	11.5	8.8	299	82	62,200
December	4	99.3	1.21	98.6	6.2	99.1	6.8	9.5	352	85	63,000
1917.											
January	15	97.3	1.62	98.3	11.6	98.0	4.4	8.5	382	55	74,900
February	29	95.2	2.56	97.5	17.8	97.8	2.3	9.4	370	30	56,200
March	33	97.0	3.52	97.1	23.2	98.2	1.8	7.7	338	32	62,000
April	52	94.3	3.20	95.9	35.0	95.4	....	6.8	439	27	62,800
May	28	94.7	4.42	93.3	28.7	96.2	8.1	4.5	377	59	72,900
June	20	96.2	4.62	92.5	13.1	97.9	22.1	2.7	422	83	.....
July	32	91.6	2.38	94.6	13.6	98.3	7.5	2.0	340	68	64,400
August	22	94.5	1.05	96.9	6.4	98.6	15.5	4.1	392	92	75,100
September	38	89.5	1.29	98.1	7.9	98.9	7.0	5.2	368	84	.....
October	69	82.1	1.98	97.2	8.4	98.8	2.7	5.1	395	43	.....
Weighted, average	20	96.1	2.47	97.1	17.6	97.7	15.9	4.4	356	71	.....

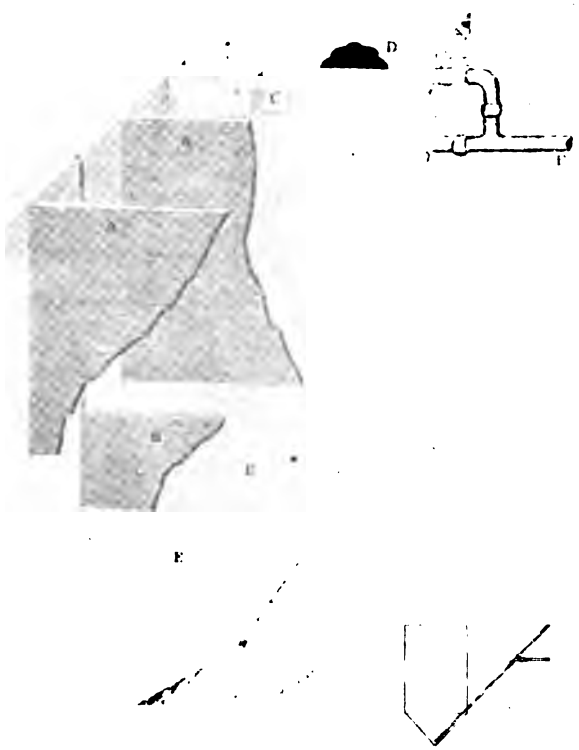
[1] Based on untreated waste.

hoppers, and scum baffles extending 5 feet into the liquid over the center of each hopper. The entire tank should be covered with a tight board cover. The effluent from the tank should overflow to a siphon chamber having a capacity of not less than one nor more than six hours' output of waste. This chamber should be provided with an automatic siphon discharging to the filter beds.

The sand filters should have an area of about 725 square feet per 1,000 gallons daily output of waste. This is equivalent to 60,000 gallons per acre per day. The upper layer should be composed of 3 feet of clean fairly coarse sand, such as would be suitable for concrete. This sand should be laid upon an underdrain system composed of parallel or radiating lines of agricultural drain tile, suitably imbedded in coarse stone graded upward to fine stone and gravel to exclude the upper sand layer. This filter should be divided into not less than 2 and preferably 4 units, with suitable arrangement for diverting the flow to one or another. The units should be used in rotation.

Intelligent supervision over the operation of this plant is essential. There will be required, first, the daily attention to alternating the doses. At periods varying from one week to one month in intervals, the filter surface may require a lighting raking. Semi-annually the tank will require attention. The accumulated sludge must be removed from the bottom, and scum from the surface. This material may be buried. In northern climates the filters will require annual preparation for winter. To this end they should be cleaned by lightly removing a surface layer of not over 1 inch, and then worked into furrows running radially from the point of application of the dose. The ridges of these furrows should project just above the water line when the full dose is applied. During cold weather they support the accumulated ice layer and permit the continued operation of the filter.

The illustration is a perspective view of the settling tank, showing all essential details. It is designed for a daily output of wastes of 5,000 gallons. The inside dimensions of the main body of the tank are 7 feet by 14 feet.



DIAGRAMATIC VIEW OF SEPTIC TANK.

The rectangular section is 10 feet deep and the hoppers, E. are 3½ feet deep. Baffles A-A extend 5 feet below the water line, and baffle B, 3 feet above the concrete ridge. The outlet C is 1 foot square. The siphon tank D has inside dimensions of 3 feet by 7 feet and 4 feet deep. The sludge-removal pipes, one in each hopper, are not shown on the main sketch, but their location and connections are indicated in the small sketch below.

The sludge line from each hopper should be made of 6-inch pipe, with valves on each line located outside the tank at such an elevation that there will be at least 3 feet static head over the outlet, when the tank is full of waste, to remove the sludge. It will probably not be necessary to remove the sludge more than once a year or possibly once in two years. As a rule, the sludge will not be offensive and can be run out on a well-drained piece of ground near the plant and left to dry. It can then be removed and buried or used on land as a fertilizer. If the plant is located near dwellings it may be advisable to dig shallow trenches and cover the sludge with earth as soon as drawn. If the plant is not too near the creamery or private dwellings, a bed of cinders with a fine layer of sand on the surface makes a more satisfactory drying bed. This bed should be 12 inches deep and underdrained with tile, but without the coarse material used in the sand filters. On such a bed the sludge can be dried in about 15 days of clear weather. It is generally advisable to draw the sludge off in the fall after the flies are dead, or early spring before they appear, and it should be done when the creek that receives the wastes is in flood so that the drainage, which will be small, can go direct to the creek.

There are two ways of removing the scum. One is to churn it up and cause as much as possible to settle to the bottom and draw it off with the sludge, and the other is to draw it off with buckets. The scum removed can be hauled away in a water-tight wagon, or it can be placed in shallow piles near the plant and covered with a thin layer of earth. The latter method is preferable and is the one recommended.

The instructions given here are sufficient to enable a sanitary engineer to construct this plant properly. It is not possible to set down more detailed specifications, except with full knowledge of the exact data of the plant in question. It is essential, however, that the works be properly designed to meet the specific requirements, and the services of a competent engineer in designing and constructing this plant are distinctly desirable.

While it is probable that with careful operation the plant described will not give rise to objectionable odors, the possibility of nuisance cannot be entirely overlooked, especially during the first few months of operation. For this reason it is desirable wherever practicable to locate the plant at some distance from dwellings and from the creamery, and to cover the tank with a tight board cover. This cover will also tend to prevent serious fly nuisance.

In view of the rather common use of septic tanks in connection with the disposal of creamery wastes, it ought to be emphasized that the septic tank itself does not constitute a system of final treatment. While such a tank provides considerable removal of organic material, the comparative figures of Table 1 show that in the essential constituents, particularly the total organic nitrogen and the oxygen consumed, there has not been sufficient improvement to prevent nuisance under the usual conditions of discharge. The primary function of a septic tank is to prepare the waste for further oxidation, and the use of the sand filter for this purpose makes it possible to discharge a final waste which is practically unobjectionable.

Municipal Journal

Published weekly at
243 West 39th Street, New York, N. Y.
by
Municipal Journal and Engineer, Inc.

S. W. HUME, *President*
J. T. MORRIS, *Treasurer* A. PRESCOTT FOLWELL, *Secretary*

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago

Contributed Articles and Reports

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

PROVIDE WORK FOR RETURNED SOLDIERS.

Cities are contributing thousands and hundreds of thousands of dollars for memorials to their sons who died in the world war. What are they doing for the soldiers who did not make the ultimate sacrifice? It is safe to say that as many heroes of the war are to be found among the living as among the dead. The former deserve as much recognition as the latter and are still with us to appreciate it in person, and the least recognition we can offer the returned soldier is to see to it that he shall be given immediate opportunity to earn a living.

The federal government has established agencies for this purpose, but it is reported that these are not at this time able to place more than half of the applicants for positions. As stated elsewhere in this issue, the state highway departments have been asked to provide work, and offer positions for about 92,000 unskilled laborers and 11,600 skilled. But ten to twenty times this number must find positions. A great many of them are landing in this country with not more than enough money to maintain them for perhaps a month, and must earn more at once.

Each of these is a citizen of some city or town, and the surest and most direct way to provide for them would be for each city or town to provide for its own citizens. If each would send word to the debarkation camps that it would look after the boys that it sent to the war, enable them to return to their home town and provide work for them, the problem would be solved.

In providing work, positions with private firms should be given as far as possible. If these are not sufficient in number, public work should be provided. Reports from many cities given on another page show that most of these are making such provision. It would seem to be safe to assume that there is no city or town that has not fallen so far behind in its public work program that all of its returning soldiers will be needed to enable it to catch up this year. If it be argued that such work will cost more now than next year, let us charge the additional cost to the aid given to those who risked their lives for us; rather, let us credit it to the city's record of patriotism, ranking with its contributions to the Red Cross.

Would it not be as much a disgrace to us if our boys should suffer at home as to have let them suffer in the trenches? Shall we let a single one suffer even anxiety about his future when our duty calls on us to prevent this by greeting him on debarkation with assurances that his home city will look out for him?

Memorials to the dead give honor to those who erect them and inspire patriotism in coming generations. Shall we cancel this honor with dishonor, and breed Bolshevists instead of patriots, by our neglect of the living?

WHY MUNICIPAL OWNERSHIP SOMETIMES FAILS.

On December 31st nearly 350 engineers employed on the subways of New York City were discharged with not more than forty-eight hours warning, some with no warning at all. There was no charge of inefficiency against these men, nor was there lack of work for them to do—several millions dollars worth of construction work was suddenly halted because of lack of engineers to supervise it. Some of these men had been connected with the service for more than ten years, and it will be difficult to find anywhere engineers to fill their places who have had experience in similar work. We will not attempt to fix the responsibility for this act, which was apparently due to politics or differences among public officials in charge of the work and of the appropriations for it. The significant thing is that such a thing could occur.

It is not to be wondered at that these engineers feel that an injustice has been done them and that all others in the employ of the city are impressed with the precariousness of their positions. Even thougs arrangements may be made for the re-employment of all or most of the discharged engineers, the effect producd canot be removed unless a most radical change be made in the conditions under which they are employed for public service. In spite of the feeling of resentment naturally aroused, it speaks well for the high character of the men that some of them offered to remain for a short time without salary in order to minimize the disastrous results that their immediate departure would occasion. It would be remarkable, however, if even the most public-spirited of them should not resolve that they would seek private employment and abandon public service where such unjust treatment is possible. They would appear to be justified in basing such resolve upon both the apparent failure to regard in any way the faithful and long-continued service that they have rendered, and also their discharge without any warning, an act which we cannot conceive of any private corporation even considering for a moment. Unfortunately, the former cause of complaint is more or less common in the cities of the United States—more common, probably, than anywhere else in the world.

There are two general incentives to perform work in any position, one of these the salary, the other a love of loyalty to the service itself. The former seldom secures the most efficient service, but such service must result from the latter incentive. What loyalty or interest in a service can be entertained by one who feels that his connection with it hangs by so slender a thread and that the efficiency of his work is so slightly appreciated as is the case in so many municipal positions? In view of such happenings, and of the too general tendency to change employes after each election, the wonder is, not so much that public ownership and operation of municipal utilities are sometimes a failure, but rather that they are so often a success. An explanation of the high-grade service rendered by so many engineers and other technical men

in charge of the public works of the country may probably be found in the professional pride and interest that they take in their work, which even the failure of public recognition is not sufficient to entirely suppress.

Fortunately there are a number of cities where the value of the service of the public employes is appreciated, and such employes are retained through years of changing administrations. Until this becomes the rule rather than the exception, American cities cannot expect to find in public ownership the benefit that they theoretically should enjoy. Until a city can guarantee that the technical men employed to conduct its public works will receive fair treatment and a recognition of efficient service, it had better abandon all thoughts of municipal ownership.

SEGREGATING TRAFFIC.

Comments on Regulations Adopted for New York City and Modifications Recommended.

At a recent meeting of the National Highways Traffic Association, the members considered, and referred to a committee for report at a later date, certain resolutions concerning traffic regulations that had been adopted for enforcement in New York City. These resolutions recommended radical modifications of the New York regulations, giving as the reasons the following:

I. Exclusion of a class of vehicular traffic from a thoroughfare, if for the purpose of expediting traffic and not for what might be termed "park traffic" reasons, should be on the basis of speed rather than that of the character of the load carried.

Comment—All horse-drawn vehicular traffic, both passenger and merchandise, is slow-moving traffic and tends to slow-down the traffic of any street on which it is permitted. On the other hand, a large percentage of merchandise delivery vehicles are fast-moving motor vehicles and cause no greater delay to the traffic of a street than the taxicab or private motor car.

The most practical test of differentiation between fast and slow-moving vehicles would appear to be the character of tire—solid or pneumatic—on which the vehicle operates. This is not an entirely satisfactory test, as there is an intermediate class of motor vehicles of one to three tons on solid tires that can make rapid speed without detriment to the public.

II. Fast-moving traffic, if separated from slow-moving traffic on the same street by the ordinary method of regulation, causes little or no delay to the traffic of a street of large traffic capacity and ought not therefore to be excluded from any street where the traffic of heavy, slow-moving vehicles is not so large as to tax the capacity of that street under proper regulations.

Comment—It is highly desirable that fast-moving traffic be permitted to distribute itself as widely as possible over the city, rather than to force it all into a few streets where the mere volume will produce congestion and delay.

On very few of the streets from which so-called passenger and private vehicles are excluded is there any condition that warrants the exclusion of fast-moving traffic.

III. The restriction of a series of continuous streets to one class of traffic results in wide diversions of the prohibited class of traffic to reach a thoroughfare on which it is permitted.

Comment—Reference is made to the restrictions of First, Second and Third avenues on the East side and Eighth, Ninth and Tenth avenues on the West side to so-called commercial traffic, and of Lexington, Fourth (Park), Madison and Fifth avenues to so-called passenger and private vehicles.

A fast-moving delivery wagon operating in the East side residential section would be obliged to continually run back and forth to Third avenue, resulting in an entirely unnecessary use of and interference with the legitimate traffic of that avenue as well as of the narrow cross streets.

Conversely, a taxicab or private motor car making a number of calls between First and Third avenues would be forced to continually run back and forth between Avenue A and Lexington avenue to comply with the regulations. In the case of a taxicab this is quickly translated into a swollen charge for the service that would make it prohibitive.

The existence of bad pavement conditions on certain streets adds measurably to the difficulty of observing or enforcing the ordinance. Seventh avenue may be cited as an example. Being practically impassable because of subway construction, it is practically eliminated as a possible thoroughfare for passenger vehicle traffic.

IV. The operation of any restrictive regulations should be limited to the period of the day when traffic is heavy.

Comment—This principle has been applied by the police commissioner to other regulations such as the one-way street matter, and there would appear to be even greater reason for its application to the new regulations.

SANDUSKY WATER PURIFICATION PLANT.

In his report for the year 1918 on the operation of the water purification plant of the Sandusky, Ohio, municipal water works, chief chemist O. F. Schoepfle states that 1,597.5 million gallons was filtered. Alum was used to the amount of 336,565 pounds, or 4,747 gallons per pound of alum. In 1917, one pound was used for each 4,262 gallons.

Of chlorine 12,884 pounds was used, or one-third more than in 1917. The plant efficiency (presumably in bacteria removal) was 99.36 per cent as compared with 99.22 per cent in 1917. The cost of operation was $314.99 less in 1918 than in 1917, although 66 million gallons more was purified.

LABOR FOR SOLDIERS ON STATE HIGHWAYS.

The Bureau of Public Roads of the United States Department of Agriculture has collected from the highway departments of the various states figures indicating the probable number of returned soldiers and sailors that can be used during 1919 in road construction and repair work. Of the thirty-eight states replying, only twenty-nine gave definite figures. They report they can use 11,637 soldiers and sailors as skilled laborers, and 91,904 as unskilled. Under the head of skilled labor the state highway departments were asked to report on the requirements for masons, carpenters, quarry bosses, concrete finishers, road foremen, roller men and superintendents. Unskilled laborers were not separated into classes.

The states that have thus far given definite figures, with the estimated number of men that may be used, are: Alabama, skilled, 60, unskilled, 1,000; Arizona, skilled, 48, unskilled, 100; Colorado, unskilled, 1,250; Connecticut, skilled and unskilled, 4,000; Delaware, skilled, 100, unskilled, 1,000; Florida, skilled, 685, unskilled, 4,315; Georgia, skilled and unskilled, 4,000; Idaho, unskilled, 200; Illinois, skilled, 2,500; unskilled, 15,000; Kansas, skilled, 1,000, unskilled, 4,800; Kentucky, skilled, 826, unskilled, 3,500; Louisiana, skilled, 110, unskilled 1,000; Maine, skilled, 100; unskilled, 1,000; Massachusetts, skilled, 150, unskilled, 2,000; Michigan, skilled, 200, unskilled, 2,500; Minnesota, skilled, 1,200, unskilled, 4,800; Mississippi, skilled and unskilled, 2,000; Montana, skilled, 104, unskilled, 644; Nebraska, skilled, 267, unskilled, 2,250; Nevada, skilled, 35, unskilled, 265; New Hampshire, skilled, 332, unskilled, 1,000; New York, skilled, 1,400, unskilled, 7,000; Oregon, skilled, 270, unskilled, 2,430; Rhode Island, skilled, 50, unskilled, 450; South Carolina, unskilled, 1,500; Virginia, skilled, 900, unskilled, 5,100; Washington, skilled and unskilled, 2,000; West Virginia, skilled, 700, unskilled, 9,300; Wisconsin, skilled, 600, unskilled, 7,500.

The WEEK'S NEWS

Validity of Indiana State Highway Law Upheld—United States Public Health Service Reserve Wants Men—Wisconsin's Pure Food Laws Constitutional—Molasses Tank Explosion Kills Many in Boston—Salary Increase Program of Boston—Pittsburgh Proposes Ten Million Dollars Improvements—Six-Cent Fares in Baltimore—Interstate Treaty for New York-New Jersey Port Development.

ROADS AND PAVEMENTS

Urges Use of War Material on Road Work.

Washington, D. C.—The Department of Agriculture is exerting efforts to secure from the War Department all available material not needed for war purposes and which can be used immediately in improving the nation's highways. Senator Bankhead, Chairman of the Committee on Post Offices and Post Roads, has called up in the Senate a resolution authorizing the Secretary of War to turn over to the Department of Agriculture any material he can spare. If the measure is successful in Congress hundreds of motor trucks, automobiles, mules, horses, etc., which have been purchased for war purposes will soon be used in building roads all over the country. The plan is to distribute the material throughout the various states. It is expected that thousands of discharged soldiers, especially of the engineer corps, will be employed in the road building.

Indiana Highway Law Declared Valid.

Indianapolis, Ind.—The state supreme court has handed down an opinion in which the state highway commission law is held constitutional, thereby reversing the judgment of Ernest R. Cloe, judge of the Hamilton circuit court. Good roads advocates, greatly pleased by this decision, said that in consequence of it they would abandon their plans for the passage of a new highway commission bill and would endeavor to amend the present law to make it stronger and more workable. The supreme court held unsound the arguments of the appellee "that the act in question violates the federal constitution in two particulars: (1) That in its operation it would have the effect of depriving him and others in like situation of property without due process of law in violation of the fourteenth amendment, and (2) that its operation would result in the taking of his property and the property of others in like situation for a public use without just compensation in violation of the fifth amendment."

This court has recently held that where a local improvement of a public nature is construed under a law providing that the costs shall be paid in whole or in part from the proceeds of special assessments to be levied on the property beneficially affected thereby the property owners have a right to notice and an opportunity to be heard before a special assessment of this kind can be legally imposed. The reason for the rule there announced is that such assessments are made on the theory that each particular piece of property assessed is especially affected and benefited to the extent at least equal to the amount of the assessment imposed. Such assessments are imposed on the theory that the property affected is enhanced in value or otherwise especially benefited to the full amount of the assessments imposed, and that nothing is exacted by the assesment which is not fully compensated by benefits actually accruing to the land affected.

The rule thus announced applies only to special assessments made against specific property based on actual benefits resulting thereto on account of a local improvement. The rule has no application to the exercise of the general taxing power of a state or any of its municipal subdivisions. Taxes levied for governmental purposes are not imposed on the basis of a special and particular benefit accruing to each citizen in proportion to the taxes paid. The protection of life, liberty and property, and the other rights, privileges, immunities and benefits which a citizen enjoys as a result of living under the protection of an organized government are of such a nature that their value cannot be measured by dollars and cents. The power to tax for such purpose is not limited to actual benefits resulting to the citizen by reason of the maintenance of government, but such power is limited only by government needs.

There can be no doubt that improvements of a public nature, such as the construction and improvement of highways, waterways, bridges and other works of a like nature, may be of such general benefit as to warrant their construction at government expense in the exercise of governmental power. Where the legislature authorizes an improvement of the character mentioned to be made by the state or by any of its governmental subdivisions it has power to determine the manner in which the fund shall be raised for the payment of the costs and expenses.

If it decides that the improvement is of such general benefit and public importance as to justify such a course it may provide that the entire fund shall be raised by a general tax. In case the work contemplated is not regarded by the law-making power as of sufficient public importance to justify the payment of the entire cost by general taxation it may provide that property beneficially affected by the improvement shall bear a portion of the cost to be especially assessed against it in proportion to the accruing benefits, and the remainder of the cost shall be paid by the municipality within which the improvement is located from funds raised by general taxation, or the legislature may provide that the entire cost and expense of the improvement shall be especially assessed against the property beneficially affected in case the total costs and expenses do not exceed the aggregate special benefits accruing to the property so affected.

The power to determine in which of these ways such a fund shall be raised is legislative in character, and the action of the legislature in that regard is binding on the other departments of government.

The power to construct and maintain public highways is a governmental function, the same as the power to build schoolhouses and support schools or to build courthouses and jails, or to construct and maintain asylums for the insane or for the dependent poor. . . . If the exercise of the taxing power in any instance is regarded by the people as unwise, unjust or oppressive the remedy must be sought through the action of the legislature. The judicial department of the state is powerless to grant relief on those grounds.

As to the contention of the appellee that the title of the law did not conform to the constitution, the court held that also invalid. The court further decided that the law was in no way local or special as had been charged. The court, near the conclusion of the opinion, replied to the averment that the law established a new department of government by saying that the highway commission is an administrative body intrusted with the application and administration of the statute under which it is appointed. In this respect it is similar to the state board of tax commissioners, the public service commission and other boards and commissions created under the laws of this state. The law is not open to the objection that it confers powers of a judicial nature on a body that is administrative in its character.

Paving Contractors Lose Fight for Payments.

Porterville, Cal.—The Federal Construction Company of San Francisco has lost its petition for a writ of mandate, brought in the Supreme Court, for an order to compel the city council to validate bonds for payment of paving contracts completed by the plaintiff corporation and of a nominal face value of $110,000. When the contracts for street work here were completed, nearly four years ago, the city refused payment on the ground the work was not done in accordance with the plans and specifications. The decision of the council was appealed to the Supreme Court of Tulare county, where the corporation lost on a writ of review and the appeal to the state Supreme Court followed. The concern based its petition for the writ of mandate on the declaration that members of the council, who passed on the work, had property covered by the securities and were therefore biased and prejudiced. This decision of the Supreme Court not only upholds the recently amended street improvement act, under which the work was done, but means in effect the construction company has no legal means of collecting a cent for all the work done here and which the city officials find was not completed in accordance with contract. What further steps will be taken by

the company is not indicated, although there are some means which may be used to again get the case into the courts. Some time ago the city offered the contractors a compromise, which was not accepted. It is possible the eventual outcome will be the acceptance on the part of the Federal Construction Company of part payment for the work.

SEWERAGE AND SANITATION

U. S. Public Health Service Reserve.

Washington, D. C.—According to a bulletin by Surgeon-General Blue the reserve of the Public Health Service is organized for the purpose of making available a corps of physicians, sanitarians and scientists, who may in time of national emergency be called to active duty in the Public Health Service. The reserve officers will ordinarily remain on inactive duty, but subject to call at any time. When an emergency arises they may be called to active service, and while so serving they will receive the compensation of their grade. The duties which reserve officers will be expected to perform are similar to those of regular officers of the Public Health Service. Those who wish to be considered for membership in the reserve are requested to comply with paragraph four of the rules and regulations for the government of the reserve of the United States Public Health Service, which provides as follows: "Citizens of the United States desirous of undergoing examination for appointment and commission in the reserve of the Public Health Service must make an application in their own handwriting requesting permission to appear before a board of examiners. An applicant for examination shall state his age, date and place of birth; present legal residence; whether he is a citizen of the United States; give the names of the schools or colleges of which he is a graduate; furnish testimonials from at least two persons as to his professional and moral character, and submit a recent photograph of himself. An applicant of foreign birth must furnish proof of American citizenship."

Supreme Court Upholds Food Laws.

Madison, Wis.—News has been received that the Wisconsin pure-food enactments of 1909, 1913 and 1915, prohibiting the sale of food products preserved with benzoate of soda, benzoic acid and derivatives, have been declared constitutional by the United States Supreme Court at Washington.

State Board Asks Enlargement of Sewerage Works.

Brockton, Mass.—In its annual report to the legislature on condition of the various rivers of the commonwealth the state department of health recommends that the sewerage works of the city of Brockton be enlarged as soon as practicable, in order to improve the condition of Salisbury Plain and Taunton rivers. Of these streams the department says: "The Salisbury Plain river below Brockton has been more seriously polluted than at any previous time. There has also been an increase in the pollution of Town river below Bridgewater, of the Nemasket river below Middleboro and of the main stream below Taunton. Improvements are under way at Brockton which when completed will no doubt relieve the Salisbury Plain river of much of the pollution which it now receives, and the proposed increase in the capacity of the disposal works will improve the character of the effluent discharged into the river. The town of Bridgewater is temporarily discharging its sewerage into Town river and has prepared plans of works for the treatment of the sewage, the construction of which was postponed on account of the war. The town of Middleboro prepared plans for the purification of the sewage of that town many years ago, but has taken no further action in the matter. The city of Taunton, acting through its sewer commissioners, began early in 1917 the preparation of plans for works for the treatment of its sewage, but owing to the lack of engineers on account of the war, the work was discontinued. The cause of this delay being now removed, it is expected that the work will be taken up again and carried to completion. It is important for the prevention of further objectionable pollution of the Taunton river and its tributaries that the sewerage works of the city of Brockton be enlarged as soon as practicable and that suitable works for the treatment of the sewage be provided in the other places herein mentioned."

WATER SUPPLY

Electrification of Water Supply Pumping.

Pueblo, Colo.—Last year, at the South Side water works an electrically driven, direct-connected pump, with a capacity of 3,000,000 gallons daily was installed. The city is now preparing to install a second unit with 6,000,000 gallons daily capacity. It is the intention of the trustees to electrify the entire pumping system during 1919. All of the energy is supplied by the Arkansas Valley Railway, Light & Power Co. The trustees have estimated an annual saving of $10,000 when the plant is completely equipped for electrical operation.

To Resume Construction of Water Works.

Altoona, Wis.—Preparations for the early resumption of work on the municipal water works plant here, as soon as weather conditions permit, are being made by A. Larson & Company, general contractors, of Eau Claire. Forms are being made there for the 60,000 gallon concrete reservoir which the company will erect in the spring, and will be taken to the scene of operations within a short time. The reservoir will be sixty feet high and fourteen feet in diameter. The reservoir will be located on top of the hill near the Altoona school house, this being 165 feet above the general area of the city, where the water will be distributed by gravity. The well from which the water will be pumped by an electrically operated pump has already been sunk. Water mains will be laid throughout the city during the spring and summer. When this project is completed Altoona will have an adequate supply of water for all purposes, including fire protection. The entire project will cost in the neighborhood of $40,000 to $50,000.

California State Water Commission.

San Francisco, Cal.—The state water commission has recommended that the salaries of two of its three $5,000 a year commissioners be abolished. The commission is composed of A. E. Chandler of Berkeley, president; W. A. Johnstone of San Dimas and Irving Martin of Stockton, who were appointed by Governor Johnson in 1914. The new formation of the commission as recommended in its report will be one executive member on a stated salary and two associate members on a per diem basis. The executive member is to have exclusive power to act on all applications to appropriate, subject to appeal to the full commission. The associate members are to perform all the duties now imposed on members of the commission except unappealed application to appropriate water. The total number of applications to appropriate water since 1914 is 1,059, according to the report. During the ten months of last year covered by the report the commission has received 528 applications, of which 202 for agricultural purposes, 34 for mining, 12 for power and 8 for domestic uses were granted. Any person obtaining a water right must apply it to beneficial uses only or forfeit his right, according to the commission. For the last two years the commission has been carrying on an investigation of the effect that the proposed storing of the waters of Alameda creek tributaries near Niles would have. Another year is allowed in which the commission expects to obtain the relation between the flow of Alameda creek and the replenishment of the underground waters of what is known as the Niles cone. The investigation is the result of the controversy of two years' standing between the Spring Valley Water Company and the Alameda County Water District. Both parties to the litigation have agreed to abide by the decision of the commission.

FIRE AND POLICE

Fatal Explosion of Molasses Tank.

Boston, Mass.—At least eleven persons were killed and many more injured by the explosion of a storage tank of molasses in the yard of the Purity Distilling Company, a subsidiary of the U. S. Industrial Alcohol Co., near Copps Wharf. The explosion blew away two of the supporting pillars of the Atlantic Avenue elevated railway structure, demolished several buildings, blew an electric freight car off the track, overturned a number of heavily loaded trucks and killed about a dozen horses. Most of the killed were teamsters and employees of the city who were at work in the city street department yard adjoining the electric freight yard where the explosion occurred. The molasses spread over the street to a depth of two or three inches. Many of those killed or injured were covered with molasses and could not be readily identified. Sailors from the United States ship Rockport at a wharf nearby were the first to assist after the explosion. They were quickly followed by surgeons of the navy stationed in the vicinity and members of the Red Cross. The tank contained 2,000,000 gallons of molasses. The most generally accepted theory of the cause of the explosion was that of fermentation of the molasses, with no point of outlet for the gases. It is understood that a slight fire is maintained to keep the molasses in a state where it will run most freely. It might be either that the fire was hotter than normal or that the molasses had some ingredient differing from ordinary molasses kept therein. The tank was seventy feet in height and seventy-five feet in diameter. The explosion came with a dull roar, but its force was terrific. As the tank—a huge iron structure containing more than two million gallons of molasses—went into the air there was no hope, naturally, for the employees in close proximity to it. Men were either killed outright by being struck by pieces of metal or engulfed in the running molasses. Fragments of the tank were thrown into the air, buildings in the neighborhood crumpled up as though the underpinnings had been pulled away from them, and scores of people in the various buildings were buried in the ruins, some dead and others badly injured. The top of the tank first shot into the air and then the walls collapsed. The force of the explosion knocked over the fire boat house of Engine 31. One of the firemen was blown into the harbor. Two others were pinned in the ruins and a fourth was not accounted for. A nearby tenement house fell in. Two women and a man were taken from the ruins, all injured.

Three Killed in Fire Truck Collisions.

Indianapolis, Ind.—The equipping of all motor apparatus in the Indianapolis fire department with high-powered motor sirens, the sound of which may be heard for blocks in every direction, has been ordered by A. L. Taggart, president of the board of safety, following a preliminary investigation by members of the board as to the cause of an accident which resulted in the death of three men —the captain of the Indianapolis salvage corps, a captain in the fire department and a member of the salvage corps —and injury to seven others. It occurred when the salvage corps truck was in collision with motor hose wagon No. 7 from fire headquarters. The investigation showed, according to the members of the board, that the salvage corps truck ran into the motor hose wagon of the fire department. Dr. Paul Robinson, coroner, said his investigation proved clearly that the accident was unavoidable. When the collision occurred the impact was so great that the hose wagon jumped the curb and crashed into the front of the Merz Motor Company building. Both trucks were responding to an alarm of fire and the accident occurred as the drivers of the machines attempted to avoid striking each other. Both pieces of apparatus arrived at the street intersection at the same time and Ankenbauer, in trying to avoid a direct collision with the fire truck, attempted to make a quick turn. The driver of the hose wagon, also trying to avoid a collision, swerved. However, the turn of the salvage corps truck was not short enough and the two trucks met at the northwest curb. Ankenbauer, Shipp, Earle and Trobaugh of the salvage corps, and Lowes and Wiley, of the first wagon, were catapulted from their seats. Captain Lowes was thrown on the mail box at the corner and was crushed between the box and the front end of the salvage corps truck. Ankenbauer was thrown head foremost to the sidewalk. Both were killed almost instantly. One contributing cause of the accident probably was the fact that the hose wagon was delayed in leaving fire headquarters, which are only one block from where the collision occurred. The headquarters of the salvage corps are in Pearl street, between Alabama and Delaware street, about four and one-half blocks from the point of the collision. Ordinarily the hose wagon would have passed before the salvage corps wagon arrived. The delay was occasioned, it was said at fire headquarters, because the alarm was first recorded incorrectly on the tape, and members of the squad waited to hear the alarm sounded from the manual. The alarm on the manual is not received at the engine houses until after the box has been recorded twice on the tape.

Urges Complete Motorization.

Auburn, N. Y.—Charles P. McCarty in submitting his own report as fire commissioner and the reports of chief Edward J. Jewhurst and fire marshal George S. Coneybear, recommends the replacement of all horse drawn apparatus with motor driven trucks at the earliest possible time. He says: "The apparatus as a whole is in good condition. I cannot say this as far as the horses are concerned. We have arrived at a point where we will have to replace several of the horses owing to old age and inactivity. I wish to make the following recommendation. The horse is sure to disappear from the fire service. The expense of his keep is increasing every year, while his efficiency is not increasing in the same proportion. If it is increasing at all, the horse is very slow in comparision to the gasoline motor for fire service. In view of the fact that the value of the motor apparatus has been so firmly established, and of the excellent service we have received from it in this city, there is not, in my opinion, a single reason in favor of the horse. While I do not feel that it would be advisable at this time to go to the expense of motorizing the entire department, it seems to me, however, that it would be a wise and economical move for the city to purchase at least one piece of motor apparatus each year until the department is motorized."

GOVERNMENT AND FINANCE

Boston's Program for Salary Increases.

Boston, Mass.—Mayor Andrew J. Peters has outlined the financial causes of the necessity of appealing to the legislature again; the need of the strictest economy in the various estimates for the coming year, and the extent to which he would go in increasing salaries. The mayor has estimated that his salary program will add $750,000 a year to the payroll, and told the department heads: "It will be a strain upon the city's resources, but if it guarantees, as it should, contented minds and loyal service, I shall consider the advance a profitable investment, as well as an act of justice." The mayor, however, has neither accepted the demands of labor organizations on the one hand nor of the finance commission on the other hand. He has striven to strike a happy medium, keeping in mind the loss of $1,000,000 in license revenue for next year, the increased demands of charitable institutions, dormant conditions which will mean but little increase in valuation and the expeited continuance of high prices for ordinary city supplies. The finance commission asked him to increase wages moderately as a war measure, but the mayor does not subscribe to that plan, the war being over. The mayor, instead of granting the appeal of the firemen for salary increases totaling $326,000 a year, is willing to create a new maximum of $1,500 to begin after a service of one year at the present maximum

of $1,400. For the policemen he will grant a new maximum of $1,500 to begin after one year. For employes on a sliding scale, the mayor will continue the increases decided upon long ago, step by step, and in increasing other employes $100 a year where the salary is below $1,800 he is following the course adopted last year. The mayor said in part: "Requests for increase of pay have recently been presented by various classes of city employes. Taken in the mass, these requests constitute a joint appeal for relief from the burden of high prices. In providing such relief as seems to be practicable, I feel that all the interested parties—and these include the taxpayers and the citizens in general, as well as the employes—should be willing to agree upon certain very simple principles.

"1. The increased cost of living must in all fairness be considered in regulating the wages of city employes.

"2. The lowest paid employes, often men with large families, should receive consideration in preference to those on liberal salaries, who would naturally have greater resources.

"3. The city, offering as it does permanency of employment, reasonable hours and other well-known advantages, should not be asked to compete with what may be called abnormal or emergency wages paid elsewhere.

"4. Increases, however desirable in themselves, cannot be granted to an extent which might involve the possibility of a reduction of the working force, with consequent unemployment for many workers and curtailment of necessary services. Discharges or even suspensions on any considerable scale would certainly produce more hardships than the continuance of employment under present conditions, which are, in most cases, tolerable, if not altogether satisfactory. I am confident that the spirit of cooperation among the employes will prevent them from pressing their demands to a point at which it might become financially and legally imperative to consider such a step.

"The possibility may not be imminent, but neither is it remote. We have, for example, a fixed limit of appropriations, which only the legislature can raise. That body in 1917, without intending to do so, actually reduced by a substantial sum the total that can be appropriated for the regular departments and the schools. To offset this reduction and to meet such calls as this from the employes and other demands not less legitimate we have no recourse at present but annual petitions to the Legislature, the success of which is contingent upon the will and disposition of that body. With reduced appropriating power the city has to face in the coming year unusual expenses, attended by a loss of customary revenue. The liquor licenses alone have brought in about $1,000,000 annually to the city treasury, and this revenue will soon be cut off. The war has immensely expanded the work of the Soldiers' Relief Department and of the Overseers of the Poor. The increased cost of supplies and material will be felt by the city institutions and by all departments doing construction work. As a result of the slackening of building operations the valuation of the city is not increasing at a normal rate. Keeping in mind the present limit of the appropriating power and looking at the whole subject with as clear and equitable a judgment as I can command, I favor the following schedule of wage increases in the budget of 1919:

"For laborers, janitors, and others in this class, a per diem increase of fifty cents.

"For firemen, a new maximum of $1,500, to begin after a service of one year at the present maximum of $1,400.

"For policemen, a new maximum of $1,500, to begin after a service of one year at the present maximum—subject, of course, to concurrent action by the Police Commissioner.

"For employes on a fixed salary, such increases as the department heads may recommend, with the understanding that no increase shall exceed one hundred dollars a year and no salary shall be raised to a figure beyond $1,800.

"For employes on a sliding scale, advance by steps at the appointed periods, according to the present system.

"For resident employes in hospitals and other institutions, who receive board in part payment and are less affected by fluctuations in prices, moderate increases to the lower grades.

"The aggregate of these increases may amount to $750,000 a year. It will be a strain upon the city's resources to provide this sum; but if it guarantees, as it should, contented minds and loyal service, I shall consider the advance a profitable investment, as well as an act of justice."

Planning $10,000,000 Improvements.

Pittsburgh, Pa.—The city planning commission, after conference with mayor E. V. Babcock, has adopted the plan of the city engineers for the Mount Washington Boulevard. It was decided this improvement should be included in the coming bond issue. This fixes the plan for city improvements so far contemplated as the widening of Diamond street, widening and paving of East Ohio street, improving Mount Oliver street, widening, grading and paving East Carson street, widening and improving East street, acquiring property and extending Butler street to connect with Highland Park and Washington Boulevard, widening and improving Second avenue, Monongahela Boulevard, widening and improving Brownsville avenue, abolishing grade crossings at Hazelwood and improving Second avenue, widening and improving William street, constructing Mount Washington Boulevard from Brownsville avenue to Merrimac street. These and provisions for repaving streets, building bridges, swimming pools, sewers, shelter houses and playgrounds, etc., will require from $10,000,000 to $12,000,000.

Western City Bothered by "Soviet."

Portland, Ore.—Mayor George Baker, with city, county and state officials, is ready with measures to be taken against members of the newly organized Local Council of Workmen, Soldiers and Sailors, should they attempt any concerted action without official sanction. The mayor declared that rumors of threatened action by members of the Workers' Council had come to him from such sources that he could not ignore them. The Council of Workmen, Soldiers and Sailors, according to information given to mayor Baker, is made up of I. W. W. and disorderly elements with some discharged soldiers and sailors, who are said to be without funds and are being sheltered and fed by the organization. Reports that members of the council at a mass meeting had threatened to seize the armory, arm themselves, and seize the heads of the local government, led to the assembling of the Multnomah County Guard at the armory, where they were held by Colonel Lewis Campbell, head of the organization, ready to respond if called upon to quell any disturbance. No outbreak occurred.

TRAFFIC AND TRANSPORATION

Commission Approves 6-Cent Fare.

Baltimore, Md.—The state public service commission has ratified the six-cent fare of the United Railways & Electric Company, Baltimore, put into effect by the company on Oct. 1. The commission has also ratified the increase to six cents in the fare charged on the buses of the Baltimore Transit Company, a subsidiary of the United Railways & Electric Company. In confirming the increase in car fare the commission stipulated that this action permitted the larger fare until Dec. 31, 1919, and that the continuance of a six-cent fare after that date depended upon circumstances. In its opinion the commission said: "The company will be required by the commission's order to make regular monthly reports of its operating results under the new rates, and if it appears at any time that a reduction of less than the full 1-cent increase can be properly required, such reduction will be made in the sale of tickets in small quantities at such prices as may be deemed expedient from time to time. This commission has decided from the facts before it in this case that the fair worth of reasonably adequate street railway service to the community served by the respondent company and under existing conditions is 6 cents as the basic rate for adults, and 4 cents as the basic rate for children between four and twelve years of age."

City Denied Co-Receiver for Transit Lines.

New York, N. Y.—Judge J. M. Mayer of the United States District Court has denied the applications of the Board of Estimate and Apportionment of New York City and of the Public Service Commission for the First District of New York for additional receivers to administer the affairs of the Brooklyn Rapid Transit Company. He made permanent, however, the appointment of Lindley M. Garrison as sole receiver. Mr. Garrison's temporary appointment was made on the last day of 1918 when the Brooklyn Company was declared bankrupt. Counsel for the city and the commission urged that the city's investment in the rapid transit system warranted the appointment of a co-receiver, but there were evidences of dissension between

them as to which body should be allowed to represent the public and who should be appointed as receiver. Judge Mayer stated that a time might come in working out the financial future of the company when the aid of a receiver representing at that time the "united view of the public authorities" might be of great service, but he thought that any co-receivers at present would destroy the efficiency of the receivership. In this connection Judge Mayer indicated pointedly that a receiver is simply a representative of the court; that private owners in the case of a receivership cannot settle affairs outside without submitting their settlement to the judgment of the court, and that the duty of the court is to conserve and operate the property under existing contracts without favoring any faction or interest. He added that the court is entitled to a singularity of purpose in a receivership, and that a co-receivership now in the B. R. T. case "might transfer from a forum outside the receivership and the court the controversies which might properly be settled at some place and time other than by court."

CITY PLANNING AND HOUSING

Proposes Interstate Treaty for Port Development.

New York, N. Y.—The New York-New Jersey Port and Harbor Development Commission has made public a "Tentative Draft of Supplementary and Amendatory Treaty Between New York and New Jersey," which it has prepared to create a legal plan for the further comprehensive development of the port of New York. This purpose, it says, can best be accomplished through the co-operation of the two states by amendment to the treaty of 1834, by which New York and New Jersey determined their respective rights and duties in and about the water surrounding this port.

Article I of the tentative treaty is a pledge from each state to the other that it will faithfully co-operate "in the future planning and development of the port of New York, holding in high trust for the benefit of the nation the special blessings and natural advantages thereof."

Article II provides for a "Port of New York District," the boundary lines of which are to be determined after public discussion, and which may, from time to time, be changed by the concurrent action of the legislatures of both states.

Article III creates "the Port of New York Authority."

This authority, as provided in Article IV, is to consist of six commissioners, three from each state. It is to be a body corporate and politic (Art. VI), "with full power and authority to purchase, acquire, construct, leave and (or) operate any terminal or transportation facility within said district; and to make charges and establish rates or tolls for the use thereof; and for any of such purposes to take, own, hold, lease, and (or) operate real or personal property, to borrow money, and secure the same by bonds or by mortgages upon any property held or to be held by it; but nothing herein contained shall affect the present legal title to any property now vested in or held by either state or by any municipality, city, county, village, township, or private individual or corporation, nor affect any bonded indebtedness of such state, municipality, or other body, individual or corporate."

By Article VII the Port Authority may receive such additional authority as may from time to time be delegated to it by the two states or by the Federal Government.

Under Article VIII no grant of land within the Port of New York now owned by either state is to be made hereafter without the approval of the Port Authority.

By Article IX, if the legislatures of the two states adopt a plan for the comprehensive development of the Port of New York, no changes are thereafter to be made in the plan except by and with the approval of the Port Authority.

By Article XII the Port Authority is given power to appear on behalf of the two states before the Interstate Commerce Commission, the Public Service Commission, the Public Utilities Commission, or any other administrative, judicial, or legislative body, for the purpose of securing the adoption and execution of any measures designed to improve the handling of commerce or the terminal and transportation facilities.

By Article XIV it is provided that the two states are to meet in equal shares the expenses of the Port Authority. By Article XVII provision is made for the Port Authority to make suitable orders, rules, and regulations within the district for the improvement of navigation and commerce of the district. Detailed machinery is provided for securing action by the municipalities, or, in the absence of such action, a determination by the Appellate Division of the Supreme Court for the First and Second Departments of New York State or by the Supreme Court of New Jersey. The commission offers the draft as a tentative plan upon which it invites public discussion. After discussion and further consideration, it will report to the legislatures of both states a form of treaty which it will recommend. With the treaty was also issued a report by Julius Henry Cohen, the commission's counsel, giving the legal considerations underlying the plan. In his report, Mr. Cohen says: "At the threshold we face the fact of dual political sovereignty. The port lies in two states, each an independent sovereignty in its own land. The legal problem, therefore, cannot so easily be stated or solved as it might before New Orleans, Philadelphia, Boston, or Baltimore." Mr. Cohen points out that "traffic between two states across boundary waters is interstate commerce," and that neither one state nor the other can wholly regulate the port. In the decision by the Interstate Commerce Commission in the New York Harbor case, it was held that "Historically, commercially, and industrially the cities of northern New Jersey within the metropolitan district constitute a part of New York." "The problem presented to the Port Commission," says Mr. Cohen, is "how shall this interstate relationship—now politically divided—be effectively united to promote the welfare of the two states and the nation?"

Proposed Village Suburbs for English City.

Bristol, England.—For several years before the war building operations in Bristol were inadequate to the city's needs, and since the war they have ceased altogether on account of the lack of labor and materials. The medical officer of health of this city estimated recently that there are 586 condemned houses in Bristol in occupation, 2,000 houses in occupation which should be condemned, and over 5,000 in occupation which are unfit for habitation. It is thought that there will be at least 3,000 houses required by returning soldiers as represented by military marriages up to 1917, and that the minimum number of houses required for the actual needs of the present population is 2,000. The health officer believes that a total of 7,250 houses will be required within the next 5 years. The section of the city inhabited by working people is made up principally of small residences of six rooms—three bedrooms, a parlor, a kitchen, and a scullery—and the rents vary from $1.35 to $1.85 a week. Few of the houses in these districts are owned by the occupants. So great is the congestion that none are ever empty. When a dwelling becomes vacant there are usually as many as 20 people on the waiting list of the landlord anxious to take the house. Those houses nearest large factories are most in demand. Few have gardens, but most of the tenants have allotments for gardening within fairly convenient reach. There is now a tendency on the part of the Government to favor the provision of houses for working people by the local authorities or by public utility companies instead of by private enterprise as heretofore. The city of Bristol is carrying out this policy by arranging to purchase 700 acres of land at a cost of about $725,000, which is to be laid out as village suburbs. Further important purchases will probably be made for this purpose at a later date. In this connection the city council has approved a recommendation that application be made to the British Local Government Board for sanction to erect 5,000 houses at the end of the war. It is proposed to develop five village suburbs at suitable points on the outskirts of the city. Each house is to have adjoining sufficient land for a garden, and the houses are to be erected not more than twelve to the acre. For every nine acres devoted to building it is proposed to devote one acre to open spaces, which are to contain tennis courts, bowling greens, and provision for other outdoor pastimes. The houses are to be semidetached or built in small blocks and set back from the street. In many cases the houses are to be planned in quadrangles, with a view to avoiding monotony of appearance. The smallest dwelling is to contain a fairly good-sized living room, a scullery, and two bedrooms, but the larger ones will have three or more bedrooms and many of them a parlor.

NEWS OF THE SOCIETIES

Feb. 25-28, 1919.—AMERICAN ROAD BUILDERS' ASSOCIATION. Sixteenth annual convention and Ninth American Good Roads Congress under the auspices of the A. R. B. A., Hotel McAlpin, New York, N. Y. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

Nov. 12-14, 1919.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

Fire Marshals' Association of North America and National Board of Fire Underwriters.

A two-day conference was held in New York City on Jan. 9 and 10 by a special committee of the Fire Marshals' Association of America and the National Board of Fire Underwriters.

The first session was opened by L. T. Hussey, state fire marshal of Kansas, as chairman, and he was followed by W. E. Mallalieu, general manager of the National Board of Fire Underwriters who spoke in the absence of the president, Frederick C. Buswell.

Figures showing that the United States leads the world in property destruction by fire were given, the damage per capita being stated as $2.10 annually in this country, as compared with 49 cents in France, 33 cents in England, 28 cents in Germany, 25 cents in Italy and Austria, 15 cents in Switzerland, and 11 cents in Holland. Sixteen thousand lives and $250,000,000 in property are lost every year in this country's fires, according to statistics. Careless smokers and users of matches were responsible for $15,724,556 of the total loss of $60,466,054 worth of property by "preventable fires" in the United States during 1918.

Alfred Fleming, of Columbus, Ohio, president of the Fire Marshals' Association, reported that more than 93 per cent of the fire prevention orders issued by states had been obeyed. He asserted that more had been accomplished in the last two years toward reducing fire waste than in the ten preceding years. He termed newspaper reporters "machine guns" and editors "heavy artillery" in the fight against fire. Mr. Fleming urged the appointment of a director of publicity and education by the underwriters. Such a man he said should be an earnest student of fire prevention and possessed of "a proper sense of news values."

Homer Rutledge, of Lansing, Mich., fire marshal of that state, discussed "The Arson Trust," and showed how incendiaries had burned $8,121,816 worth of property in one year during the war, exclusive of the many other millions destroyed indirectly by explosions. Ole O. Roe, of Des Moines, fire marshal of Iowa, in an address on "Pyromania," said education was one of the most efficient means of combating this evil. F. R. Morgaridge of New York, formerly assistant fire marshal of Indiana, said most firebugs were adolescent boys and girls. He advocated proper home and school training.

Despite the fact that the United States was at war and that enemy agents were active, twenty states reported a slight decrease in the number of cases of arson. While it was announced as a fact that in the first nine months after the country declared war, $43,000,000 worth of war industries went up in smoke, in only 10 per cent. of these cases was there even suspicion of spy-work. "Carelessness" was designated as the biggest firebug of all. One grain elevator fire alone destroyed enough wheat to make a year's supply of bread for 200,000 soldiers.

Many fires at first attributed to German spies and pyromaniacs were found, upon investigation, to be due to other causes. One notable instance was a spectacular and costly waterfront fire in Brooklyn, the Dow's Stores, in which a vast quantity of grain intended for shipment to the Allies was destroyed. It was discovered that the blaze was the result of a dust explosion caused by a spark either from friction or static electricity. Another conspicuous instance was the Baltimore pier fire, which at first was positively ascribed to pro-German plotters. Rigid investigation by Federal agents, according to fire marshals, definitely determined its non-incendiary origin.

Following a reference to the Morgan, N. J., disaster, in which nearly one hundred lives were lost and $20,000,000 damage done, delegates spoke of the work accomplished the past year by the fire prevention section of the War Industries Board. This bureau, it was stated, had inspected more than 2,000 large plants, valued at over $10,000,000,000, and in a large percentage of cases the "safety" recommendations of its volunteer dollar-a-year engineers were carried out.

It was stated that fire prevention methods adopted for the sixteen large army cantonments throughout the United States had proved most effective, although these camps consisted of wooden buildings. Hazards were reduced to the minimum by proper watchfulness, water protection, isolation, conducting, and enforcement of regulations in regard to smoking and the use of matches and lights.

Fire Chief Kenlon, of New York City said that if a serious blaze had started during the armistice celebrations all New York might have been laid in ashes. The fire department would have been crippled also, he said, by the crowds and traffic congestion in the streets. As one of the delegates expressed it, "Thus was invited the greatest loss of life and property, perhaps, in American history."

For every man enrolled in cantonments and camps in the United States, the Government suffered a fire loss of forty-six cents last year, while for

(Continued on page 79)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

A STORM DRAIN SYSTEM is to built by the city of Douglas, Ariz., for which $100,000 in bonds is to be voted. The consulting engineers are Olmsted & Gillelen.

Vermillion, O., is to make extensive PAVING and SEWER IMPROVEMENTS, according to plans being prepared by the consulting engineer, Mr. Gascoign. The plans include brick paving to cost $40,000.

DRAINAGE SYSTEM is to be built by the city of Phoenix, Ariz., involving ten miles of tile pipe, to cost about $150,000. The consulting engineer is H. Phillips.

Mitchell, S. D., is soon to receive bids for WATERWORKS IMPROVEMENTS to cost about $100,000. The plans were prepared by the consulting engineers, Burns & McDonnell.

The Keeney Creek and Ray Drainage Districts, Richmond, Mo., plan to build DRAINAGE SYSTEMS, including drainage ditch, levees and flood ways, to cost $150,000 and $225,000 respectively. Plans are being prepared by the consulting engineering firm of C. E. Jacoby Engineering Company.

A CONCRETE BRIDGE is to be built by the city of Glenwood, Ark., according to plans being prepared by the Burnham Engineering Company, consulting engineers.

Trenton, N. J., plans to build a three-pier, reinforced concrete BRIDGE over Sanhican Creek. The plans have been prepared by the consulting engineer, H. Harris.

Laredo, Texas, is to build a sanitary SEWERAGE SYSTEM, to cost about $200,000, according to plans being prepared by the F. A. Jones Engineering and Construction Company, consulting engineers.

Webster City, Ia., is to receive bids for the construction of a 1,000,000-gallon WATER PURIFICATION PLANT according to plans prepared by the consulting engineer, C. H. Currie.

The Courtney Drainage District, Courtney, Mo., is having plans prepared for a FLOOD PROTECTION SYSTEM along the Missouri River and Mill Creek, comprising 1,000 acres. The plans are being prepared by the consulting engineers, the C. E. Jacoby Engineering Company.

INDUSTRIAL NEWS

The Warren Foundry and Machine Company, New York City, which manufactures cast-iron pipe, announces the appointment of H. H. Kinsey as New England representative, with offices at 201 Devonshire street, Boston, Mass. Mr. Kinsey has been engaged in selling water-works supplies for the past twenty years.

The National Slag Association, at a recent meeting in Cleveland, elected officers for the year 1919 and appointed an executive committee. The three officers elected are F. A. Sarstedt, C. E. Ireland and H. J. Love, elected respectively president, vice-president and secretary-treasurer, and the executive committee consists of F. A. Sarstedt, L. A. Beeghley, L. H. Hawblitz, E. H. Kuttner and C. L. McKenzie. The executive committee was authorized to act as a contact or co-operation committee, with similar committees appointed by the national organizations which are supported by the sand, gravel and stone interests in the United States.

The association announces that in all about 80 per cent. of the commercialized blast furnace slag tonnage of the country is represented by this association, whose aim is the ultimate standardization of this product when used as railroad ballast, concrete aggregate, or in macadam highway construction.

The American-La France Fire Engine Company, Inc., Elmira, N. Y., announces that it has shipped the following orders:

Windber, Pa., type 12, comb. chem. eng. and hose car; Hudson Falls, N. Y., Union Paper Bag & Paper Co., type 12, triple; Washington, D. C., type 20, booster pump; Watervliet, N. Y., type 33, hook and ladder truck; New Kensington, Pa., type 12, triple comb. chem. eng. and hose car; Blackwell, Okla., Brockway comb. chem. eng. and hose car; Providence, R. I., type 17, tractor; Windber, Pa., type 12, triple comb. chem. eng. and hose car; Puget Sound, Wash., type 12, triple comb. chem. eng. and hose car; Okura & Co., Yokohama, Japan, 2 type, 31 tractors; Carrick, Pa., type 12, chem. eng. and hose car with junior pump; Omaha, Neb., triple comb. chem. eng. and hose car; St. Louis, Mo., type 14, com. chem. eng. and hose car; Westbury, N. Y., type 12, triple comb. chem. eng. and hose car; New Holland, Pa., type 40, comb., with junior pump; Ithaca, N. Y., type 12, triple comb. chem. eng. and hose car; Aurora, Ill., type 12, triple comb. chem. eng. and hose car; Baltimore, Md., comb. piston pumping eng. and hose car; Tacoma, Wash., type 14, comb. service truck; Missouri Valley, Ia., type 40, comb. chem. eng. and hose car; Rochester, N. Y., type 40, chassis; Madison, S. Dakota, type 40, comb., with junior pump; Philadelphia, Pa., type 10, salvage corps car; Camp Hollabird, Md., type 12, triple comb. chem. eng. and hose car.

National Automotive Electric Service Association.

A new organization has been organized with this name to promote and improve service on electrical equipment of automotive vehicles in the United States by co-operation between its members and others interested in the same line of business. The membership will be by firms rather than individuals, each one being entitled to two representatives with one vote for each. Any firm whose entire business is devoted to service on the electrical equipment of automotive vehicles will be eligible to membership in this association. Officers elected were: President, Arthur Jones, president of the Arthur Jones Electric Company, Chicago; secretary, John W. Rusicka, manager Motor Electric Equipment Company.

NEWS OF THE SOCIETIES

(*Continued from page 78*)

civilians during the year 1917, when the last authentic figures and average were available, the loss was $2.46 per capita.

The difference is due to adequate fire protection and prevention, according to the report made by Sheldon Catlin, of Philadelphia, chairman of the committee on fire prevention and construction of buildings. Mr. Catlin, who is vice-president of the Insurance Company of North America, Philadelphia, showed that the Board of Underwriters had loaned to the Government during the last half of 1917 and all of 1918 almost its total engineering force to use in war work. As a result an engineer was on duty at every camp and cantonment to prevent fire loss.

The figures show that in the camps the Government sustained a loss of only $488,330, which is very low compared with losses sustained in the larger cities. Much of this was credited to work of the engineers, who had installed water systems, proper building codes, and fire-fighting equipment.

Three big shipyard fires of the year were discussed, one being held to the building in which it originated by good work. The other two could have been prevented had the water system and other preventative measures been installed, as recommended by engineers, the report shows.

The fire marshals present at the conference with the underwriters included five committees on co-operation between the two organizations whose efforts are directed to "warring on carelessness" and to increasing the efficiency of fire prevention in the United States. These committees follow:

Incendiarism and arson, F. S. Bartow, New York, chairman; Homer Rutledge, Lansing, Mich.; F. M. Morgaridge, New York; Ole O. Roe, Des Moines, Ia.; actuarial bureau, James Wyper, Hartford, Conn., chairman; John G. Gamber, Springfield, Ill.; Charles H. Lum, New York; L. T. Hussey, Topeka, Kan.; fire prevention and construction of buildings, Sheldon Catlin, Philadelphia, chairman; James R. Young, Raleigh, N. C.; George W. Booth, Ira H. Woolson, and Chief John Kenlon, of the New York Fire Department; public relations, E. W. West, of Glen Falls, N. Y., chairman; Goodwin Lee, T. A. Fleming, and H. C. Brearly, of New York.

Society of Automotive Engineers.

The Society of Automotive Engineers announces that the date of its annual winter meeting has been changed from January 12-14 to February 4-6 as a matter of convenience for members who desire to attend the automobile show which will be held at Madison Square Garden the first two weeks in February.

National Highway Traffic Association.

A conference on "Regulations Covering Speed, Weight and Dimensions of Motor Trucks" will be held under the auspices of the National Highway Traffic Association at the Automobile Club of America, 247 West 54th street, New York City, at 8 p. m., on Friday, January 31.

The discussion will be opened by members of the following committees on motor-truck regulations: Chairman, George H. Pride, president, Heavy Haulage Company, formerly member, Highways Transport Committee, Council of National Defense; Charles J. Bennett, state highway commissioner of Connecticut; Charles G. Bond, counsel, Motor Truck Association of America; H. Eltinge Breed, first deputy highway commissioner of New York; David C. Fenner, president, Motor Truck Association of America, formerly member War Industries Board, Automotive Section; George M. Graham, general sales manager, Pierce-Arrow Motor Car Company, formerly chairman National Motor Truck Committee, National Automobile Chamber of Commerce; A. H. Hinkle, deputy highway commissioner of Ohio; S. V. Norton, manager, truck tire sales, B. F. Goodrich Rubber Company; W. G. Thompson, state highway engineer of New Jersey; Lt.-Col. W. D. Uhler, chief engineer, Pennsylvania state highway department, formerly chief of operation, Motor Transport Corps, U. S. Army; A. H. Blanchard, consulting highway engineer, ex-officio.

It is requested by the association that highway officials, engineers, manufacturers and owners of motor trucks freely present their views and thus aid in the solution of a problem which vitally affects the economic development of highway improvement and motor transportation.

An informal dinner, at $1.50 a cover, will be served in the grill room of the club at 6:30 p. m. Dinner reservations should be mailed to Secretary Elmer Thompson, 247 West 54th street, New York City.

North Dakota Society of Engineers.

The eleventh annual convention of the North Dakota Society of Engineers will be held at Valley City, N. D., January 30 and 31.

The subjects to be discussed will include highways and highway improvement, drainage, municipal work, the field of the county surveyor, legislation affecting the work and the status of all engineers, and other topics.

The president of the society is E. J. Thomas, Minot, N. D., and the secretary is E. F. Chandler, University, N. D.

American Civic Association.

Five national housing and civic associations and the American Federation of Labor went on record at a recent meeting here in favor of the creation of a federal bureau for industrial housing, town planning and community planning in the broad sense of dealing with the entire physical environment of the inhabitants. The organizations are the American Institute of Architects, the American Civic Association, the National Housing Association, the National Association of Real Estate Exchanges and the National Municipal League.

Two sessions of some thirty representatives of these organizations, with others from all parts of the country interested in housing and civic development, were held here at the suggestion of the American Civic Association. The meetings were called by Lawson Purdy, Samuel Gompers, J. Horace McFarland, Frederick Law Olmsted and Robert W. DeForest. The following statement was issued:

"A committee was appointed to secure the co-operation of national organizations in drafting a bill to create such a bureau, either in the Department of Labor or the Department of the Interior. The purpose of the bureau will be research, experimentation and the dissemination of information, acting as a central agency for the service of state authorities and local committees.

"It was the sense of the meeting that the scope of the federal agency should include action toward creating a comprehensive and systematic mechanism to facilitate the financing of housing, but no recommendation was made as to how this shall be done. The chair was authorized to appoint a committee to appear before the House Committee on Building and Grounds to oppose the passage of the Senate resolution providing for the stopping of work on Department of Labor building projects not 75 per cent. completed."

Following these meetings there was held the first conference under the auspices of the United States Department of Labor to project the new program for improving the living conditions for employed classes. John Richards, of Washington, chairman of the newly formed Commission on Living Conditions Among Industrial Workers, discussed the project broadly before about one hundred local housing, civic and social workers, but did not go into detail of how the commission expects to organize.

Richards said that the trouble with most organizations in the past has been that they start at the top. The purpose of the commission, he continued, is to include every group in its new plan. Roughly, it will investigate through local committees the two problems, labor and leisure time. Under the latter heading Richards said nearly every sociolological problem could be included. Judge J. Willis Martin, chairman of the Philadelphia Council of National Defence, presided.

PERSONALS

Otis, Harrison Gray, executive secretary of the City Managers' Association, has resigned as city manager of Auburn, Maine, and is now affiliated with the American City Bureau to assist in the further promotion of the commission-manager plan.

Plattner, William W., who for the past ten years has been superintendent of the electric light and water departments of North Attleboro, Mass., has resigned to take his place in the state legislature, to which he was elected. Under his supervision both departments have enjoyed an excellent growth, and this is particularly true of the electric light department. Mr. Plattner was born in Ohio thirty-five years ago. For more than twenty years he has been in public service work, consisting of electric light, water works, electric railways, telephone and gas service. Previous to coming to North Attleboro he was superintendent of the board of public affairs in Bluffton, Ohio. During the past eight years he has acted as a consulting expert for various municipalities in matters pertaining to electric light and power, water works, gas and street railway work; in matters such as franchise rights, municipal ownership, rate regulation and arbitration of rates. He is a member of the American Institute of Electrical Engineers, American Water Works Association, American Academy of Political Science and the New England Water Works Association.

Phelps, Charles E., former chief engineer for the public service commission of Maryland, died recently. He was born in 1871 and received his first technical training at Johns Hopkins University in 1891-1893. In 1902 he was retained by the city of Cleveland to report and estimate upon the cost of an electric street and commercial lighting project adopted by the city council. In 1903 he was retained by the cities of Johnstown, N. Y., and Rochester, N. Y., in litigation over the construction and operation of underground electric conduit systems, and by the city of Montreal to report and estimate upon an underground conduit system project. Two years later he was retained by the city of New York to assist in the investigation of charges for electric street lighting. Later he became chief engineer for the electric commission of the city of Baltimore, and was in charge of the construction of underground conduits. He also served as secretary of the municipal lighting commission of Baltimore and as a member of the sewerage commission. In 1910 he became chief engineer for the public service commission of Maryland, and five years later was appointed to the Maryland state board of health as engineering member.

Gill, Hiram Charles, three times mayor of Seattle, Wash., died there recently of pneumonia, following influenza. He was 53 years old. Gill came to Seattle over thirty years ago after graduating from the University of Wisconsin. For a time he worked in a water-front restaurant and studied law and stenography. Later he entered a local law office. In the early 90's Gill was elected to the city council. In 1910 he was elected mayor but was recalled in 1911. He ran again in 1912, but was defeated. In 1914 he tried again and was elected. He was elected again in 1916, but lost in a contest at the primaries last year.

Attacks on his personal honesty he defeated, but he was compelled to retire to private life with his political principles rejected and himself a center of national interest because of his trial on a Federal indictment charging him with having shielded the Billingsley brothers, noted bootleggers. He was acquitted of this charge. When Gill was elected mayor he adopted a "wide-open-town" policy, with Charles W. Wappenstein as Chief of Police. Wappenstein was convicted on graft charges and sent to the penitentiary. In 1914 he reversed his former policy, waging vigorous war on vice in all its forms. During his last administration Major-General H. A. Greene, in command of Camp Lewis, put a ban on the city, forbidding his soldiers visiting it until an alleged vice syndicate was cleaned up. Mayor Gill maintained that the city was reasonably clean. Attempts to secure his impeachment were finally defeated by a vote of the city council.

Governor Smith, of New York state, has appointed Lewis Nixon, engineer and shipbuilder and former Tammany Hall leader, state superintendent of public works; Michael T. Walsh, of Yonkers, is appointed state tax commissioner.

Municipal Journal

Volume XLVI NEW YORK, FEBRUARY 1, 1919 No. 5

A SIPHON RESERVOIR BLOW-OFF

For Wasting Bottom Water from Rio Grande Reservoir, Canal Zone—Bottom Water Rendered Foul by Organic Matter—Analyses Showing Improvement Resulting from Use of Siphon.

By GEO. C. BUNKER.*

The installation of a siphon was proposed by the writer in order to draw off the stagnant water on the bottom of the Rio Grande reservoir, for this had not been done during a period of about fourteen years because the original 20-inch blow-off had been buried under concrete and rock.

Fourteen-inch cast-iron and spiral-riveted steel pipe were used in the construction of the siphon, which was carried over the top of the spillway. The center of the crown is 2 feet above the top of the spillway; the up-stream leg is 39 feet 9 inches long, which brings the end to within 3 feet 6 inches of the bottom of the reservoir. The down-stream leg runs down to the old bed of the Rio Grande River, a vertical distance of 35 feet 3 inches, with a gate valve on the unsubmerged end. One-inch taps are provided in the crown for filling the siphon with water from a pressure line and removing the air by a small hand-pump.

The siphon was placed in operation at 2:15 P. M., December 4, 1918, without any trouble and allowed to run with the discharge valve one-half open until 9:15 A. M. December 6. During this period of 67 hours the water was drawn down 14.5 inches below the top of the spillway, representing a volume of 25,000,000 gallons. It was not considered desirable to draw off a larger volume, as the rainy season was nearly finished. In the future the siphon will be operated during the rainy season at such times as the water starts to flow over the spillway, so that the stagnant water on the bottom of the reservoir will be wasted and the fresh water in the run-off will be saved.

This procedure is very essential in the tropics to prevent an accumulation of the disagreeable waste products of the processes of decomposition with the resultant impairment of the quality of the water.

This impounding reservoir was formed in 1888 when the French Canal Company constructed a dam across the Rio Grande River, a short distance south of Culebra, to furnish water for construction purposes. In 1904 the height of the dam was raised 17 feet by the Isthmian Canal Commission to an elevation of 235 feet above mean sea level. The capacity of the reservoir at this elevation is 400,000,000 gallons. The area of the watershed is 2,015 acres and of the water surface is 62 acres. The gate house, on the lower side of the dam and close to it, is 9 by 11 feet in plan by 50 feet deep. When built, it was provided with three 16-inch intakes, at elevations of 192, 216 and 224. In 1905 a 16-inch cast-iron main was run to a reservoir in Ancon and from this reservoir water was supplied to Panama City for the first time on July 4, 1905. In March, 1915, the Miraflores purification plant was placed in operation with its raw water supply coming from the Chagres River, so that the reservoir was abandoned as a source of supply for the southern end of the Canal Zone.

At the present time the reservoir furnishes the water supply for Culebra. Para grass grows very abundantly along the shore line and when submerged by a rise in elevation it rapidly turns brown, thus contributing a large amount of coloring matter to the water in addition to furnishing organic matter for the putrefactive reactions in the bottom layers of the water. In June, 1917,

SIPHON AT RIO GRANDE RESERVOIR.

*In charge of Canal Zone water purification and laboratories of Municipal Engineering Division.

special fittings were caulked into the two intakes, which were located at depths of 11 and 19 feet below the surface of the water, and vertical pipes attached which were extended to within 3 feet of the maximum elevation. After these surface intakes had been placed in use, it was possible to obtain water of a quality greatly superior to that formerly drawn from the same intakes at the lower levels.

As previously mentioned, the blow-off valve had not been used for about fourteen years, with the result that a zone of foul water of considerable depth had accumulated on the bottom of the reservoir. On October 21, 1918, there was a rainfall of 4.59 inches in twenty-four hours, resulting in a flood on the water-shed of the Rio Grande River, which is the largest feeder to the reservoir. The large and sudden inrush of fresh water stirred up the foul water on the bottom of the reservoir and mixed it throughout the entire volume of water in the lower end. The effect is best illustrated by giving analyses of the water passing out through the surface intakes before and after the rain:

Analyses of Water Removed Through Surface Intakes.

	6 days before the rain.	1 day after the rain.
	Parts per Million	
Date of collection	10/15/18	10/22/18
Source of sample	3 feet below surface	
Color—		
Total	35	225
True	0	22
Odor	3-e	4-e
Turbidity	2	30
Free carbonic acid	4.6	6.3
Alkalinity to erythrosine	48.6	42.5
Hardness, soap	48.1	42.4
Iron (Fe)	0.4	2.4
Chlorides (Cl)	3.6	3.0
Oxygen consumed	3.1	6.2
Oxygen dissolved	3.6	0.0
Per cent saturation	45.0	0.0
Nitrogen as:		
Nitrites	0.002	0.0005
Nitrates	0.08	0.02

On October 24th, three days after the rain, samples were collected in front of the dam at depths of 4, 21 and 42 feet below the surface to learn the difference in composition of the top, middle and bottom water:

Analyses of Water at Different Depths.

	Parts per Million		
Depth below surface, feet	4	21	42
Color—			
Total	96	295	490
True	35	59	86
Odor	4-earthy	4-musty earthy	4-musty earthy
Turbidity	15	60	400
Free carbonic acid	4.0	3.0	3.4
Alkalinity to erythrosine	43.0	28.3	27.3
Hardness, soap	43.3	28.3	26.6
Iron (Fe)	1.0	3.2	10.4
Chlorides (Cl)	3.6	3.6	3.2
Oxygen consumed	5.2	11.4	18.3
Oxygen dissolved	5.0	1.1	0.3
Per cent saturation	63.2	13.3	3.6
Nitrogen as			
Nitrites	Trace	0.002	0.005
Nitrates	0.02	0.025	0.03

It was not until December 3, 1918, that the water as drawn from 2 feet below the surface was in nearly the same condition as prior to the rain on October 21, 1918. Had the siphonic blow-off been installed before the rainy season started and the bottom water wasted instead of the run-off, the conditions represented by the analyses of the samples collected after the heavy rain would not have resulted. Following are partial analyses of the water drawn from the bottom of the reservoir by the siphon two hours after it was started, and that taken two feet below the surface through the intake:

Analyses of Water from Bottom and Surface Two Hours After Starting Siphon.

	Parts per Million	
Source of sample	Bottom	2 feet below surface
Date of collection	12/4/18	12/3/18
Color		
Total	206	37
True	35	0
Odor	4-Hydrogen sulphide	4-e
Turbidity	16	10
Free carbonic acid	12.4	....
Carbonate (CO_3)	....	2.4
Alkalinity, erythrosine	35.5	43.6
Hardness, soap	34.9	39.9
Iron (Fe)	3.0	0.5
Chlorides (Cl)	3.3	3.4
Oxygen consumed	5.7	3.8
Oxygen dissolved	*	7.0
Per cent. saturation		88.3
Nitrogen as		
Free ammonia	0.336	....
Albuminoid ammonia	0.312	....
Nitrites	None	0.0005
Nitrates	0.04	0.025
Total solids	116.0	
Fixed residue	82.0	

*Sample could not be collected.

The siphon was installed by A. S. Boyd and A. K. Evans, of Pedro Miguel, under the direction of the acting municipal engineer, R. C. Hardman.

ROCHESTER'S SEWER AND PAVING SPECIFICATIONS.

New Specifications for Pavement, Sidewalk and Sewer Construction Adopted by the Engineering Department for After-the-War Work.

By JAMES W. ROUTH.*

As a part of its preparation for after-the-war work, the Engineering Department of the city of Rochester has revised and rewritten its specifications for pavement, sewer and sidewalk construction.

For some time the need for a complete revision of specifications has been evident. The old specifications date back several years and no consistent effort was made to keep them up to date. When occasion demanded, sections were added or eliminated (seldom the latter), with the result that they became contradictory in places and were poorly arranged. Observation of work done indicated that, while in many cases the specifications were not observed, yet frequently this was true because of their inadequacy. Without doubt the same condition obtains in many cities.

Points of interest in the new specifications are outlined briefly under the several heads following:

FORM.

The specifications are being printed in loose-leaf form, the page size corresponding to that of the inspectors' notebooks. They have been divided into seven general or main divisions, dealing respectively with the contract and proposal form, general requirements applying to all construction, specifications for materials, specifications for pavement construction, specifications for sewer construction, specifications for sidewalk construction, and specifications for special and miscellaneous structures and operations.

By separating specifications governing materials from those governing operations, there is avoided the necessity for duplicating the specifications for materials in the various sections devoted to operations. Thus the possibility of conflicting specifications for materials is avoided. Furthermore, if the requirements for all classes of materials are grouped in one section, there can be no doubt

*Chief engineer, Rochester Bureau of Municipal Research.

as to where such requirements may be found or as to which requirements will govern in any case. The old specifications were found somewhat faulty in this respect.

The same arguments apply also to the separation, one from another, of the several specifications governing operations. Moreover, there is gained additional clearness from grouping together in one section all specifications relating to the particular class of work covered therein. Thus it will no longer be necessary, as has been the case in the past, to search through every part of the general specifications for clauses governing any one class of work.

MATERIALS.

One of the chief faults of ordinary specifications and practice in general is the failure to state specifically the requirements for proper control of materials used in the work. In order to overcome this difficulty, there is included in the new Rochester specifications a general provision that all materials used in any work covered by the specifications are subject to the approval of the Engineering Testing Laboratory; that the contractor must obtain the written permission of the Testing Laboratory, endorsed by the Engineer, before using any such materials; and that failure to obtain such permission shall be considered proof of the inferior quality of the materials in question. In addition, it is provided that if tests made after such materials have been used in the work shall prove conclusively that they are of inferior quality, then all work including such materials may be ordered to be torn out and replaced with approved materials at the contractor's expense, or deductions may be made from payments to the contractor in sufficient amount fully to compensate for the inferior quality of the materials. This provision is believed to be perfectly fair and yet to be severe enough to ensure proper control over all materials.

The specifications for aggregate for concrete contain another provision which is believed to be rather novel. This is a description of the method in which samples shall be taken. The purpose of this is to ensure that fair representative samples are taken in each case. The principles involved are too well understood to warrant description here. The novelty consists in including in specifications for materials, and as a part of the general specifications for any work, a statement of the method in which samples shall be taken.

The question of sand for concrete was given considerable attention. It has seemed difficult to obtain a uniform quality of sand in Rochester and on that account special study was given this matter. As a result, the specifications provide for a definite grading of sand, which it has been found possible to obtain locally, and the use of the elutriation test, suggested by the Conference of State Highway Testing Engineers and Chemists, as well as the colorimetric test worked out by Professor Abrams and Oscar E. Harder of the Structural Materials Research Laboratory, Chicago.

A hardness test is required for coarse aggregate. Crusher-run stone, bank-run gravel or artificial mixes of fine and coarse aggregate are not allowed to be used except by special permission and in proportions determined in each case by the Testing Laboratory.

Concrete is defined in five classes for special uses, as indicated in the following table which is taken from the specifications:

Table No. 1—Classification for Concrete.

Class.	Proportion.*	Uses.
A	1:1½:3 (¼"-1" stone)	One-course sidewalks.
B	1:2:4 (¼"-1" stone)	1. Lower part of 2-course walks. 2. Copings and reinforced beams, slabs, and thin walls when directed. 3. Concrete catch basins.
C	1:2½:5 (¼"-1½" stone)	1. Pavement foundations. 2. Reinforced walls, etc., when ordered.
D	1:3:6 (¾"-2" stone)	Mass concrete when directed.
E	1:8 (Torpedo Gravel)	1. Around curb. 2. Sewer cradles.

*Note: Machine mixed—1 bag of cement taken as 1 cu. ft. Hand mixed—1 bag of cement taken as 9/10 cu. ft.

In connection with the proportioning and mixing of concrete, special stress is placed upon the quality and amount of water used. It is required that mixers used by contractors shall be provided with automatic devices for measuring water, and also that no mixer shall be used which leaves to the judgment of laborers the proper proportioning of the ingredients of each batch. It is also provided that boom-and-bucket type mixers are preferred for use in pavement work, and that if mixers are provided with spouts in place of booms and buckets, the spouts shall have a definite slope believed sufficient to carry concrete of the proper consistency without stoppage or segregation of materials.

The specifications for bituminous materials set definite limits for each of the several classes of asphaltic cement allowed to be used. These limits are set tentatively as shown in Table No. 2, it being clearly provided that the limits shall be subject to revision from time to time as laboratory analyses indicate the need.

PAVEMENT CONSTRUCTION.

Special attention is paid to the preparation of the subgrade and concrete foundation for pavements. It has

Table No. 2—Test Requirements for Different Asphalts.

	California Asphalts.	Mixture of California with Hard Natural Asphalts.	Bermudez Asphalts.	Trinidad Asphalts.	Texas or Mexican Asphalts.
Penetration at 77° F.	20				35-70
Soluble in carbon disulphide	98%		90-96	50-58	99.5
Loss by volatilization (325°)	5%				
Ductility at 77°—Penetration 50	40 cm.				
A. C. penetration at 77°	55-75	45-70	50-70	40-60	55-70
Proportion of flux	10:100		25:100	25:100	
Penetration (10 at 32°)	350 at 115°	300 at 115°	300 at 115°	300 at 115°	
Bitumen ductility at 77°*	40	20	30	30	30**
Loss by volatilization (325°)	5%	5%	5%	5%	3%
Final penetration (portion of original)	½	½	½	½	½
Maximum temperature	350° F	350°	350°	350°	350°
Filler	10%	8%	10%	6%	10%
Bitumen (soluble in carbon disulphide)	9.5-11%	10-12.5%	10-12.5%	10-11.5%	10-11.5%
Minimum temperature	230°F.	250°F.	250°F.	250°F.	230°F.

*Penetration 50, Dow machine. **Add 2 centimeters for each 5 points in penetration above 50 penetration.
Note: Table to be amplified by the Testing Laboratory.

been proved conclusively that many pavement failures result from carelessness in the preparation of the subgrade and from inferior workmanship in the foundation course itself. On this account the specifications state clearly the condition that it is desired to obtain in the subgrade before concrete is laid. Drainage is provided for by requiring the placing of four-inch vitrified pipe with bell joints in trenches back of the curbs. It is also provided that, when unstable soil conditions obtain in the subgrade, transverse trenches filled with broken stone or gravel may be required at such intervals and to such depths as directed by the engineer.

Before concrete is laid on the subgrade, the latter is required to be rechecked and placed in specified good condition. In place of specifying the standard 1:3:6 concrete, a 1:2½:5 mix is required with a thickness of 5, 6, 8 or 10 inches, according to the character of traffic and type of wearing surface. [For example, the five-inch base generally will be used only where a brick wearing surface with a cement-sand cushion is used.] The concrete is required to be shaped with templates, floated and carefully cured. In case a wood block wearing surface is to be laid, a roller-and-belt finish is specified.

In Rochester a stone-filled sheet asphalt is laid. The new specifications indicate that the binder course may be omitted in residential streets. Variations in the finished surface exceeding one-quarter of an inch in three feet, or three-eighths of an inch in six feet are required to be corrected as prescribed by the engineer.

The sand cushion, so long a source of weakness in brick pavements, has been eliminated from the new specifications and a thin cement cushion composed of one part Portland cement and four parts sand is substituted. A sand cushion may be used where traffic conditions are such that a grout filler cannot be used. In such cases a bituminous filler is required. It is believed that a grout filler and sand cushion are not a satisfactory type of construction in any case, and the sand cushion with bituminous filler will be used only in cases of absolute necessity under exceptional traffic conditions. The finished brick surface is required to be free from depressions exceeding one-quarter of an inch, as determined by the application of a ten-foot straight edge. Provision is made for the use of a small batch mixer equipped with a hooded spout reaching to the pavement for grouting brick pavements.

The sand cushion and sand filler have been eliminated from the specifications for wood block pavements also. As indicated in the foregoing, the concrete base is required to be finished with a roller and belt, and in such cases the blocks are laid directly upon a pitch coat applied to the concrete base. Provision is made also, however, where it does not appear practicable to roller finish the base, to use a mortar bed cushion with a bituminous paint coat. Bituminous filler is required in either case.

SEWER CONSTRUCTION.

In general, the specifications for sewer construction are those of the American Society for Municipal Improvements, certain modifications, of course, being made to meet peculiar local conditions. One addition to the specifications, which is not believed to be ordinary, is the requirement that blasting shall not be done within 100 feet of pipe laying.

SIDEWALK CONSTRUCTION.

It is believed that this is a matter which frequently is slighted in city specifications. The subgrade is required to be as carefully prepared for sidewalks as for pavements. The customary drainage course, ordinarily composed of cinders or gravel, is eliminated in general. Where drainage is required, particularly in low spots, soft ground, etc., screened gravel or broken stone is required and outlet for water caught in this drainage course is provided for by specifying the use of three-inch farm tile connected with the nearest sewers.

It is believed that one-course concrete walks are more satisfactory in general than the customary two-course walks, so that in the new specifications one-course walks are specified for use on all residential streets.

CONCLUSION.

Further discussion of these specifications would demand unnecessary space. It is believed that enough description has been given to indicate the many new and desirable features involved.

First steps toward rewriting the Rochester specifications were taken about a year ago, when the writer prepared a tentative draft of new specifications which was submitted to the city engineer as a basis for discussion. Since then conferences have been held between representatives of the Engineering Department and of the Bureau of Municipal Research. The Engineering Department was represented by E. A. Fisher, acting city engineer, and assistant engineers I. E. Matthews and F. A. Delavau; and the Bureau of Municipal Research by the writer and J. O. Preston, assistant engineer, who, under the supervision of the writer, has been in close touch with engineering and construction work done by the city of Rochester during the last three years.

WATER WORKS OPERATION—RESERVOIR MAINTENANCE.

Drawing Off Foul Bottom Water—Removing Vegetation from Exposed Bottom—Preventing and Destroying Algae.

Water in reservoirs in the great majority of cases improves in character by standing, suspended matters settling out and pathogenic bacteria (if any are present) settling with the heavier matters or dying in a few days. Color, also, generally fades out gradually. Part of the improvement is due to oxygen from the air and to sunlight, and the effects of these do not penetrate to any great depth; consequently it is desirable that there be a vertical circulation that will bring to the surface in succession water from all depths. On the other hand, violent circulation or rapid motion will interfere with purification by sedimentation.

Slow circulation is produced by light winds and by variations in temperature between day and night, but does not extend to any considerable depth. An occasional storm will stir the water to a greater depth and bring to the surface, to receive the benefit of light and air, water that was below the general circulation. Such storm is also likely to stir up suspended matter on the bottom where the depth is less than 15 or 20 feet, and bring to the surface both this and the less pure water; the general effect, however, is beneficial. If the withdrawal of water from the reservoir can be discontinued for a day or two after such violent agitation, the character of the supply will be improved thereby. The shallower the reservoir the greater is the effect of this stirring up. Such objectionable occurrences can be avoided in most cases by deepening and sloping all parts of the shore so that the slope is not flatter than two on one, and the foot of the slope is at least 20 feet deep.

Water more than 15 or 20 feet deep is seldom stirred by wind, and any organic matter which may collect below this depth, receiving little oxygen from above, putrefies; color in the water at this depth is not bleached; and in

general this deep water may become foul, dark colored and ill-smelling unless it receives little or no organic matter to produce such conditions.

In the autumn, the surface water cools more and more as the average air temperature falls, and finally becomes cooler and consequently heavier than the water at the bottom and settles to and displaces such bottom water, forcing it to the top, bringing the accumulated pollution with it. This fall "overturn" often causes this foul water to enter the supply mains.

The general pollution of the reservoir in this way may be avoided by drawing off the foul water from the bottom before the overturn begins. If there is a blow-off pipe at the lowest part of the reservoir embankment or dam, this can be used for this purpose; or a pipe can be carried as a siphon from the deepest part of the reservoir over the bank and down the outside. (Such a siphon is described elsewhere in this issue.) This reduces the amount of water in the reservoir, which may be seriously objectionable; but on the other hand, the water so drawn off would probably be totally unfit for use. By such withdrawal it may be possible to avoid the gross pollution of excellent, potable water in the upper 20 feet of a reservoir.

Such pollution of the lower stratum of water will not occur unless the general supply contains considerable organic matter, and this of course should be prevented if possible. The drainage of swamps and preventing leaves blowing into the water will aid in this. Pollution in some cases is due to the fact that, when the water in the reservoir falls during the summer, a rank growth of grass and weeds takes place on the banks so exposed; then, when the reservoir fills again, this vegetation is submerged and dies. This should be avoided by cutting off the vegetation close to the ground just before the water reached it and removing it from the banks. Or, if it is dry, it may be possible to burn it off, although this of course should not be done if there is any danger of the spread of the fire. Paving the banks will wholly or greatly prevent the growth of vegetation on them.

ALGAE.

Odors and tastes in water supplies are caused in many reservoirs by the growth in them of algae of a number of varieties. Algae are vegetable organisms that develop in water only in the presence of light and that live upon organic matter. Many of them secrete an oil, which is released when the algae die and sometimes when they are broken up by violent agitation of the water caused by winds. Owing to their demand for light, they develop only in the upper few inches of the water if it be turbid, although in very clear water they have been found at a depth of twenty or twenty-five feet. They require oxygen for their development and therefore their presence in abundance combined with large quantities of dead organic matter may result in the putrefaction of the latter. Any sudden increase in the amount of organic matter in the upper layers of a reservoir, such as by the overturning above referred to or by such matter washed from the catchment area by storms, may cause a sudden development of algae with its resulting objectionable features.

Some of the algae found more commonly in the reservoirs of this country are the asterionella, which give a fishy or aromatic odor; anabaena, which give a grassy, green corn or nasturtium odor; uroglena, which give a fishy and oily odor. In addition to these there are perhaps a score which have been identified more or less frequently.

In order to prevent the odors and taste caused by the oil secretions of algae, it is necessary to either prevent their development in the reservoir, kill them before the oil is secreted in any quantity, or remove them from the reservoir before the oil sacks have been broken. The first can apparently be effected only by preventing the entrance into the reservoir of the organic matter which furnishes their food (which is not possible in all cases), or by excluding light from the reservoir. While a reservoir must apparently be seeded by individuals of any particular specie before such specie can develop there, it is not yet known just how this seeding takes place. It is possibly through the agency of birds, since there will suddenly appear in a reservoir species not to be found anywhere else in the vicinity.

Light is excluded from small reservoirs by roofing them over, and this effectually prevents the growth of algae. But roofing large reservoirs would seem to be impracticable. Floating wooden roofs have been tried, but not with success so far as known; warping, rotting, breaking by storms, floating limbs of trees, ice, etc., are some of the reasons of failure.

For killing algae, the material now used almost universally is copper sulphate. This material was first used for this purpose by Moore and Kellerman of the U. S. Department of Agriculture in 1903, and its use studied by them; since which time considerable additional experience has been had in its use. It is important that the proper amount of copper sulphate be used, for too little will be practically ineffective, while if too much is used it may kill fish and other animal organisms in the reservoir, and the death of these may result in destroying the equilibrium in the reservoir between animal and vegetable organisms and result in the objectionable decomposition of one or the other. The amounts of copper used are so small that there is no possibility of any injury to the human consumers, which is further prevented by the fact that most of the copper reacts with any calcium which may be in the water and forms copper hydrate, which is precipitated. Organic matter in solution in the water tends to retard the action, but matter in suspension hastens the precipitation. In addition to hardness and amount of organic matter, the presence of carbonic acid and the temperature affect the amount of copper sulphate required. Kellerman, from his experiments, states that the following amounts are best for destroying the several algae named: Asterionella, 0.8 pound per million gallons of water; spirogyra, 1.7 pounds; anabaena, 0.8 pound; oscillaria, 1.7 pounds; uroglena, 0.4 pound; crenothrix, 2.5 pounds; beggiatoa, 41.5 pounds. Besides beggiatoa, only one organism named by Kellerman requires more than eight pounds. These quantities apply to water at about 60° Fahrenheit, the quantity to be increased by about 1¼% for each degree below this and decreased at the same rate for each degree above it.

In determining the amount to be used, the contents of the reservoir is to be calculated, including all water which will be reached by the treatment. This will ordinarily include all the water above the bottom stagnant layer, that is, all down to the depth that is reached by the circulation of the water when conditions are as they are at the time of application. Algae may sometimes be present at a depth a little greater than is reached by the copper sulphate, and later be brought to the surface by vertical currents caused by temperature changes or by wind, requiring a subsequent treatment. For this reason inspection of the reservoir for algae should continue after the treatment.

Copper sulphate is usually applied by placing the required amount of commercial blue vitriol in a bag of coarse cloth, a bucket perforated with nail holes, or a wire basket, and towing it behind a boat back and forth across the reservoir. It is generally found best

to draw the copper sulphate across in parallel lines about twenty feet apart. The number of trips can be halved by placing outriggers on the boat with a basket of copper sulphate at the end of each, so as to apply the solution in two lines at a time. The most desirable rate is found to be that secured by rapid rowing. (A motor boat may of course be used if one is available.) It is preferable to use too rapid a rate rather than one that is too slow, since in the latter case the desired amount of chemical might be completely used up before the entire reservoir had been covered. A strong wind blowing or any other condition that promotes the circulation of the water aids in the distribution of the chemical throughout the reservoir.

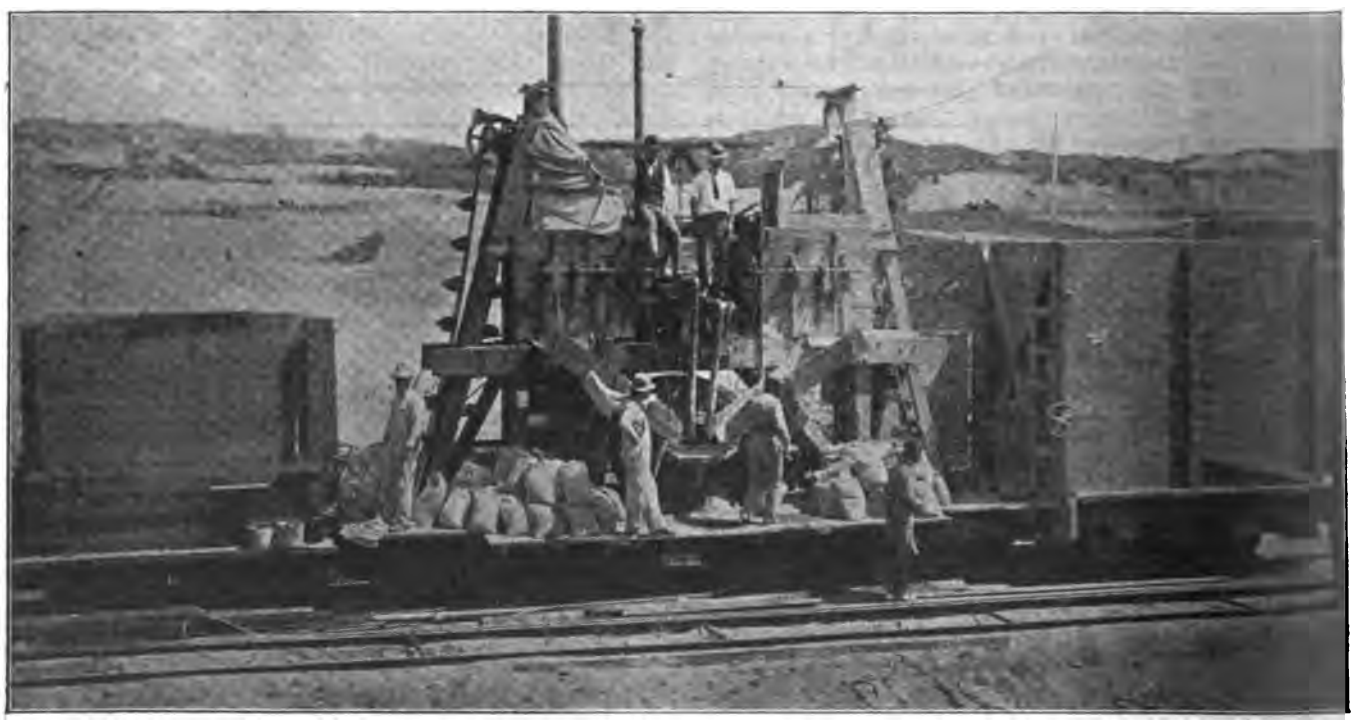
The blue vitriol kills the algae and they will then decompose more or less rapidly, releasing the oils, which may then be noticeable for a few days; although if it is possible to treat the reservoir when the algae first begin to develop, this can be very largely avoided. By having the chemical and appliances ready for instant use and by carefully watching the reservoir for appearances of algae at the season when they have been noticed in previous years, it may be possible to prevent their development in any considerable quantities. It is of course improbable that any treatment will reach all the algae present, and those not killed by the first treatment will serve as seed for starting another growth. It therefore generally is necessary to repeat the treatment at intervals throughout the season when the algae develop or while the vegetable matter that serves as their food is present.

The odors resulting from decomposition of the algae which have been destroyed can sometimes be kept out of the supply by by-passing the reservoir during and for a few days after the application of the copper. Some superintendents have found it possible to remove a considerable quantity of the destroyed algae by skimming them from the water along the lee side of the reservoir when there has been sufficient wind to cause them to collect there.

When water impregnated with algae taste must be used, it is generally possible to remove the taste by aeration and filtration. One of the worst waters on record from this point of view, that of Springfield, Mass., was rendered palatable by aerating, passing through four filters in succession, and again aerating and filtering. The first filters clogged rapidly with masses of algae and needed to be cleaned frequently.

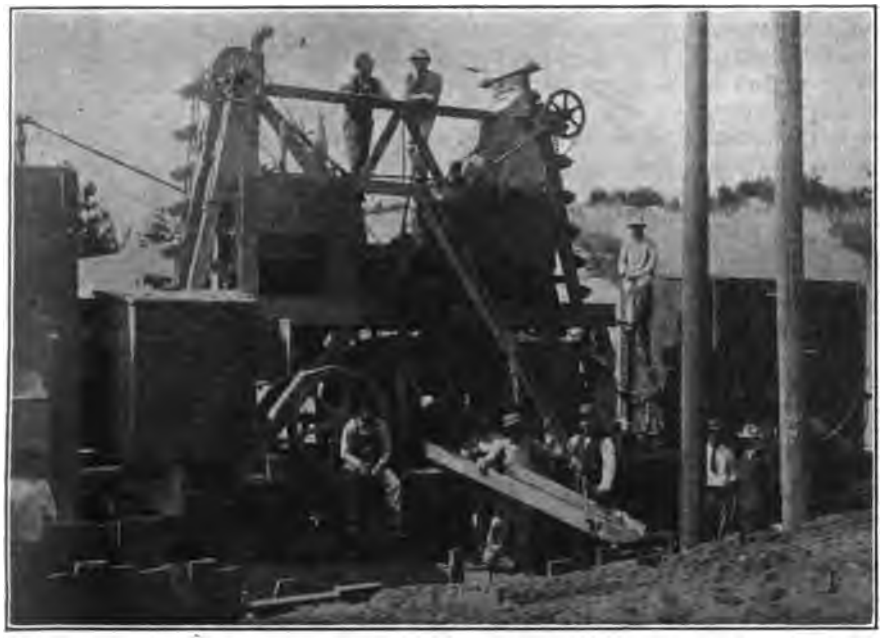
DISCHARGING CONCRETE FROM BUGGY THROUGH TUNNEL.

There are other animal and vegetable matters that sometimes are found in considerable quantities in reservoirs, such as plankton or vegetable growths that are not attached to the bottom of the reservoir, pollen and other vegetable matters blown from the fields and woods onto the surface of the water, etc. Most of these either float upon the surface or settle more or less rapidly to the bottom. Drawing them into the distribution system can generally be avoided by withdrawing the water from the reservoir at a point a short distance below the surface—say about three to five feet. Where the outlet from the reservoir is not so constructed as to permit withdrawing the water from such depth, this can sometimes be effected by constructing around the outlet a



REAR VIEW OF PORTABLE CONCRETE MIXING PLANT.

In the center, pipes leading from water barrels to mixer. On each side of these, chutes for charging sand and broken stone into mixer, these being released from measuring boxes by sliding doors raised by rack and pinion operated by hand wheels.



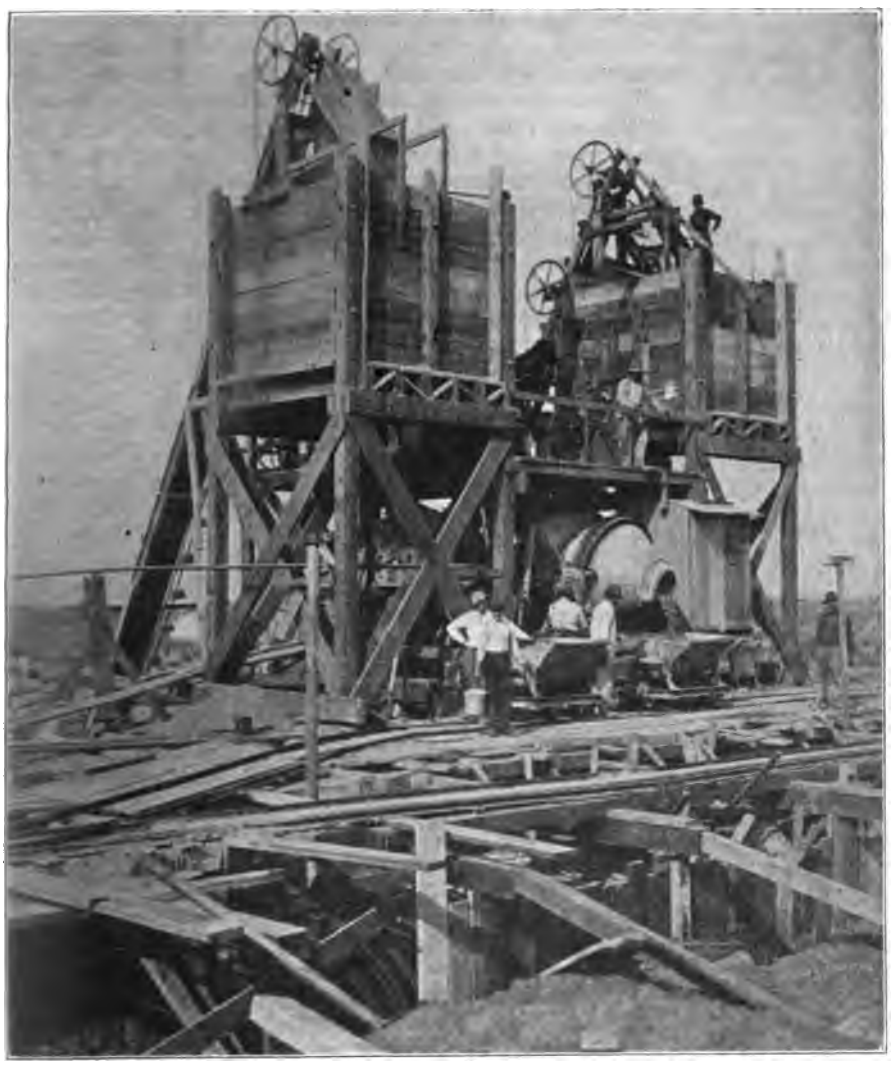
FRONT VIEW OF PORTABLE MIXING PLANT.

floating structure of wood carrying a continuous submerged baffle of wood or other material, thus requiring the water withdrawn to pass under the baffle. The baffle should be as long as possible—that is, incloses as large an area around the outlet as may be—for if the length of the baffle be too short, the velocity of the water passing under it may be so great as to carry down some of the matters floating on the surface. The structure carrying the baffle should be provided with footway of planks so that the attendant may at intervals remove from behind the baffles floating matters that collect there.

The above of course refers almost exclusively to impounding reservoirs or others formed by the construction of a dam across a natural valley. Distributing reservoirs or other small ones into which water is pumped or flows by gravity through long mains ordinarily do not receive any of the organisms referred to. At any rate, the system should be so operated that these reservoirs do not receive any organic matter. Should such matter reach a small reservoir, however, the general conditions and treatment would be the same as for large. *(To be continued.)*

TWO SEWER CONSTRUCTION PLANTS.

In constructing a concrete sewer through an outlying section of San Francisco, the Metropolitan Construction Company took advantage of the fact that the sewer ran parallel and close to a double line of street railway tracks and rented the track alongside of the trench for construction purposes, use of it for passenger traffic being discontinued until the work was completed.



STATIONARY CONCRETE MIXING PLANT FOR BUILDING 8-FOOT REINFORCED CONCRETE SEWER.

The contractor used for constructing this sewer a concrete mixing plant that was mounted on railway trucks and moved from point to point so as to discharge the concrete directly into the sewer forms. The plant was in three units, the middle one consisting of a mixer, two measuring bins located above it, and at each end of this unit a conveyor for raising the fine and coarse aggregate respectively into the bins. The two end units consisted of large bins or bunkers for holding the sand and broken stone used for the concrete. Each bunker was provided, at the bottom of the end nearest the mixer, with a sliding door, through which door the aggregate was discharged directly into the elevator buckets. Above the mixer was a working platform on which the operators regulated the doors from the measuring bins, by which the aggregate was discharged into the mixer by gravity. The central unit also carried water barrels from which, through a pipe leading to the mixer, water was supplied by gravity. The mixer and elevators were operated by electric motor, power being taken from trolley wires above the track.

As the mixer was set upon the platform of the car, it was possible to obtain a good fall through a chute for

carrying the concrete to the sewer forms, and the concrete was discharged directly into the forms through such chute. Where for special work or if for other reason it was not desirable to discharge directly into the forms, the customary two-wheel concrete buggy was used, discharging into the forms through a sheet-iron funnel and spout.

Another plant which, however, was fixed in position is shown by one of the illustrations, this being used for constructing an eight-foot reinforced concrete sewer in Forty-sixth avenue. The broken stone and sand were elevated by conveyors to two bunkers which were built slightly higher than the mixer. From these the aggregates were discharged onto and measured on an elevated platform and then dropped into the mixer. The concrete was delivered to the work in side-dump cars running on construction track, each car holding a batch of concrete. In this plant also, the mixer and the conveyor were operated by electricity.

LONG BEACH MUNICIPAL MARKETS.

Outdoor Markets and Fish Market Pay All Expenses from Small Fees Charged.

The city of Long Beach, Cal., has maintained municipal curbstone markets since March, 1913, but it was not until 1918 that it established a fish market, which is believed to be unique among municipal markets.

The outdoor curbstone market was adopted because the Southern California weather permits an outdoor market the year round without serious inconvenience. In addition, one block from the business center of the city is located Pacific Park, the streets surrounding which are quite wide. The market idea was originally started by the Woman's City Club, joined later by the Chamber of Commerce and other citizen organizations. The committee appointed by these organizations operated the market at first, all of the funds used being contributed privately. From the beginning the market has been self-supporting, no public funds ever having been appropriated for it. At the outset there was a vigorous campaign of advertising and on the opening day one thousand market baskets were given away to those who patronized the market.

Although no public money was appropriated, the consent of the council had, of course, to be obtained for the use of the streets, and ordinances were passed providing for adequate regulation and permitting the charging of a fee.

The market began by occupying 300 feet on Pacific avenue, later spreading to 300 feet on Broadway and 600 on Cedar avenue, but this last stretch was abandoned later, and the market is now confined to the two 300-foot stretches. Each vendor is allotted six feet of curb and a distance of 18 feet at right angles to the curb on Broadway and 20 feet on Pacific avenue.

The fees which vendors have paid has varied from time to time, but at present is 25 cents a day, in addition to which non-producers pay a regular city license of $5 per year, which goes into the city treasury. In return for the 25-cent fee, the market department supplies each vendor with a table and umbrella and a stall number which must be kept in plain sight, and sweeps the streets after the market is closed.

A market master and an assistant constantly patrol the market while it is in use to insure strict compliance with the rules. Experience at Long Beach is believed to prove beyond doubt that the successful conduct of a public market requires the constant supervision of a market master who devotes time and study to market conditions, prices, quality of produce sold and strict enforcement of sanitary regulations. The market is open from seven in the morning till twelve on Tuesdays, Thursdays and Saturdays. If market day falls on a legal holiday, the market is held on the day preceding.

The fish market resulted from the fact that the catches of mackerel in February, 1918, were so large that the fish market at the outer end of the municipal pier was not able to handle all of the fish caught and the fishermen sold them directly to citizens as they left the shore end of the pier. These sales became so popular that within a few days a crowd of a hundred or more assembled every afternoon at four o'clock when the fish boats arrived to purchase direct from the fishermen. In order to provide some regulation for these sales, a location directly under the pier was selected and tables, scales and wrapping paper furnished, no charge being made therefor.

After a month better quarters were provided in a room on the lower deck of the auditorium, where cleaning tables and wash tanks were placed. The vendors were supplied with aprons, towels and scales, and a charge was made of one cent per pound on all fish sold. This arrangement proved very popular and has been continued under rules prescribed by the Public Affairs Department.

When this market had been in operation for a short time it was found that prices charged by vendors were unnecessarily high and a private fish market at the outer end of Pine avenue pier was taken over by the city, newly equipped, and a municipal fish market opened which reduced the price of fish and since then has established retail prices. In connection with this, in August, 1918, a kippering plant was put into operation where tuna, herring, mackerel and other fish are cured and smoked and find a ready sale at a price that well justifies the venture. The fish market was equipped by use of funds taken from the market fund and no tax money was used in connection with the project. In six months from its opening on April 1st the fish market had returned to the market fund the original cost of installation, in addition to paying all operating costs.

The municipal markets are under the supervision of the Department of Public Affairs, Eugene E. Tincher, commissioner. S. F. DuRee is market master, having occupied that position since the early days of the municipal market.

REFUSE DISPOSAL IN WINNETKA.

Prior to 1917, the refuse of the village of Winnetka, Ill., had been handled under contract by a non-resident farmer, whose employes were not directly under village supervision, and the service was very unsatisfactory.

In August, 1917, a new plan was inaugurated, using municipally owned equipment specially designed for the purpose, and operated by collectors reporting directly to the village office. This service consists of three collections of garbage each week, with a similar collection of ashes each week during the winter. For this service a small charge is made, based on the number of rooms in the house. In addition to this, a universal collection of rubbish is made on regular schedule every two weeks. The entire service is under the direction of a superintendent, who is directly responsible for service and for operating costs.

Under the present plan, the garbage is being hauled out of the village and disposed of to farmers, who feed it to pigs. Ashes have been placed upon unimproved streets of the village, in order to partially alleviate the muddy condition during the spring months. Rubbish, including tin cans, broken crockery, etc., is being hauled to some vacant lots owned by the village and used for fill. Before beginning the fill, about two feet of top soil was removed and sold at a price which offsets the cost of removal.

Municipal Journal

Published weekly at
243 West 39th Street, New York, N. Y.
by
Municipal Journal and Engineer, Inc.

S. W. HUME, *President*
J. T. MORRIS, *Treasurer* A. PRESCOTT FOLWELL, *Secretary*

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago

Contributed Articles and Reports

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

SPECIFICATIONS FOR PUBLIC WORKS.

The writer once, as a young assistant in an engineer's office, watched and wondered at the evolution of a set of specifications for a sewerage system. At that time (about thirty years ago) there were no "standard" specifications and few of any kind that were worthy the name, and this engineer had never before built any sewers. He read the few books available on the subject and several sets of specifications used by other cities. Whenever he found an idea or a paragraph that impressed him favorably, he adopted it as a part of his specifications. Finally he grouped these paragraphs under heads, labeled the whole "Specifications," and received bids on the basis of these and the plans. The writer later had charge of the work under these specifications, and found his suspicions justified. They were so contradictory, so redundant at some points and so entirely lacking at others, that in many features of the work the contractor could not be held to any particular instructions.

Specification writing has improved greatly since then, but still has a long way to go to reach perfection. Specifications are still put together bit by bit and year by year; new ideas and developments in the art give rise to new paragraphs without sufficient care being taken to adjust all the original ones to accord with the new. On the other hand, recent legal decisions are not always noted and specifications modified to comply with them, and many discredited ideas are still found.

Perhaps the most common faults, and ones to which the others are partly due, are the lack of logical or intelligent arrangement of the several parts of the specifications and the inexact or improper use of the language employed to express the ideas. It would seem to be necessary that specifications be written by engineers, and unfortunately engineers as a class are lacking in ability to arrange their ideas in logical order and to express them in precise, correct and understandable language. It is one of the criticisms most often made of our engineering schools that this drawback is to be found in most of their graduates.

Specifications should tell a contractor just how the engineer expects him to carry on the work. Since they form part of a legal agreement, they should stand the test of law and should be scrutinized carefully, as to both requirements and forms of statement, by a lawyer thoroughly informed in the law of contracts. Finally, the instructions should be so arranged that all those referring to any given feature of the work may be found readily; they should be expressed so clearly that there can be no misunderstanding any part of them; each word should be precisely the one to express the intended meaning, and the punctuation should further rather than defeat the intention of the writer.

Specifications are as essential as plans for securing the construction of a piece of work in the way and form desired. Inconsistency in the former is as serious as plans showing an inch pin to fit into a ¾-inch hole. Conflict of the specifications with the law of the land may be as serious as conflict of the plans with the law of gravity. Lack of precision in the use of words may lead to as much misunderstanding as failure to indicate certain dimensions on the plan, necessitating scaling the drawing to determine them.

An engineer who makes perfect plans but imperfect specificaitons for public works has done but half his duty, and in some cases by no means the more important half.

PAVEMENT FOUNDATIONS.

For years the problem before paving engineers was to prevent destruction of the surface by abrasion of iron tires and impact of horses' feet. This problem is fast disappearing—has to a large extent disappeared, not only because rubber tires and motor traction are taking the place of iron tires and horses, but also because surface materials and constructions have been developed to resist both fairly well.

But the change from horses to motors has resulted in heavier loads also, and the problem these present is to a large extent one of foundations. It is true that some surface materials in common use will not withstand the heaviest loads without rapid wear, but pavements can be laid that will, provided the foundation does not yield. If the foundation will not support the loads brought on to the pavement, however, no kind of wearing surface will last.

This has been said many times, and it is self-evident to anyone. And yet cities keep right on laying the same thickness of base that they have been using for the last ten years or more; and use the same thickness on all streets and under all kinds of wearing surface. If six inches of concrete is enough now under eight and ten-ton loads, it was too much a few years ago when three and four tons were the maximum. If it is not too much now on residence streets, it is too little on those carrying motor truck traffic from freight depots. And if six inches is not too much on a soil of solidly packed hardpan it is much too little on soft loam or over trenches that, no matter how carefully refilled, are sure to settle somewhat in spots.

This failure to make any adaptation of thickness of base to load to be carried or to nature of soil can not be charged against all cities, we are glad to say. As told elsewhere in this issue, Rochester, N. Y., uses thickness of base varying from 5 to 10 inches, giving a theoretical range of strength of 400 per cent; the 5-inch base being probably stronger than the average 6-inch because of the richer mix of concrete used. Other cities increase the thickness or use reinforcement where the base is laid over trenches (instances of such use have been described in the Municipal Journal). These are the exceptions; but until it becomes the rule to adapt the strength of pavement base to the duty it has to perform, it can not be claimed that pavement construction is on a scientific basis.

The WEEK'S NEWS

Oregon's Highway Expenditures—Convict Labor on New Jersey Highways—Influenza—Government's Widespread Venereal Disease Campaign—Natural Gas Waste in West Virginia—Reorganization of Indianapolis Police Department—Policewomen in Washington—Ohio Municipalities Organize for Financial Relief Legislation—New York State's Reconstruction Commission—Garbage Collection in Spokane and Indianapolis.

ROADS AND PAVEMENTS

Oregon Spent $3,0000,000 on Roads.

Salem, Ore.—A statement issued by the state highway commission as part of the biennial report shows the total amount of money received from all funds during the years 1917 and 1918 was $3,561,790.37. The total expenditures were $2,888,257.68, leaving a balance on hand of $673,532.69. These amounts are classified as follows: Quarter mill tax fund —Total receipts, $546,260.51; expenditures, $528,789.99; balance on hand December 1, 1918, $17,470.52. Automobile license fund—Receipts, $575,000; expenditures, $281,902.67; balance, $293,097.33. Six million dollar bond fund—Receipts, $2,050,045.42; expenditures, $2,049,025.47; balance, $1,019.95. Bean-Barrett bonds—Receipts, $390,484.44; expenditures, $28,539.55; balance, $361,944.89. The report to the governor shows that an average of six proposals were received for each issue under the $6,000,000 bonding act. Work accomplished during the biennium is summed up as 50 miles of hard surface laid, 111.8 miles of broken stone or gravel, 134.5 miles of roadbed graded and 40 bridges built. "With the close of the war," says the report, "and the prospect of declining prices of material and a more plentiful supply of labor the commission looks forward to 1919 as a year in which a great deal can be accomplished, and at this date a tentative program has been prepared providing for the improvement of state highways in every county of the state." Under the post road law 17 projects have been agreed upon, according to the statement, and up to the present time ten have been approved, three disapproved, two are pending and two are in preparation. Under the forest road law 14 projects have been approved. Construction has been started on four of them and several will be carried over into the 1920 program.

State Labor Supervisor for Highway Work.

Trenton, N. J.—State highway engineer W. G. Thompson has submitted to the state highway commission a complete outline of what the department intends to accomplish by the use of state labor during the present year. It is proposed, Mr. Thompson reported, to continue and complete the relocated section of route No. 1, between Menlo Park and Rahway, with reformatory labor, which will be quartered at the institution, thereby obviating any additional expense for housing. The section of route No. 13, between Kingston and Ten Mile Run, now being constructed with labor from the state prison, will be continued, the men being housed at the camp along the Brunswick turnpike, near Monmouth Junction. It is proposed to proceed with all possible energy on the construction of the section of route No. 9 over the West Portal hill, from the end of the macadam pavement at Perryville to West Portal. Convicts from the state prison engaged in this work are housed at the camp recently established on the West Portal hill. At the height of the season about seventy-five men from the Rahway Reformatory will be engaged in road work, and about 225 from the state prison. Mr. Thompson's report said: "Inasmuch as the three projects above mentioned will just about utilize the equipment we now have, it is considered undesirable at this time to locate additional camps or start new projects which would require the purchase of additional equipment, until the present installations have, beyond the shadow of a doubt, demonstrated their value. This does not mean that this office has any doubt as to the value of the work of these men, but that it is unwilling to incur additional expense for equipment until the free labor situation is more nearly normal, inasmuch as we have had much difficulty in securing competent mechanics from the ranks of free labor to keep our equipment in repair. We may, during the summer, increase the number of men employed on these three projects, but cannot at this time recommend increasing the present camp facilities." H. C. Shinn, assistant division engineer of the central division, was appointed supervisor of state labor at an annual salary of $3,000.

Work Stopped on Utah Desert Cut-Off.

Salt Lake City, Utah.—Work on both the Fisher and Goodyear sections of the Lincoln Highway in western Utah has been stopped for the winter owing to the cold weather and to the excessive moisture which has been experienced on the Desert. The gang of convicts which had been working in Fisher Pass for the past five months has been returned to the state prison, and the machinery and equipment used in the construction of the cut-off across the Desert has been stored for the winter. The free men working on the Desert with tractors and graders have accomplished the completion of twelve miles of grade to a width of 20 feet and a height of 3 feet above high water. The convict gang working in the Fisher Pass has completed three and a half miles of good, graded surface mountain road, 15 to 18 feet wide, and drained on the upper side. There remains about 2,000 feet of the Fisher Pass road to be completed, this all on the west side of the Pass, and about five miles of grading on the Desert construction and the graveling of the entire section. Work will be renewed on both sections at the earliest possible date in the spring, according to the advice of Ira R. Browning, state highway engineer of Utah, and will be carried through to completion, if possible, by June 1st, at which time it is expected to dedicate the route and open it formally with ceremonies, in which the governors of both Utah and Nevada will participate, as well as officials of the Lincoln Highway Association.

SEWERAGE AND SANITATION

Declares Influenza Cause Is Unknown.

Albany, N. Y.—According to a statement by Dr. Hermann M. Biggs, state commissioner of health, in this state in the month of October alone approximately 32,000 lives were lost, while in the country as a whole 400,000 people are believed to have died of so-called influenza during the months of September, October and November. "It is questionable," says the statement, "if any recorded epidemic has produced in a similar space of time such disastrous results, yet, despite the efforts of an army of research workers both here and abroad, the definite causative agent of the disease remains today unknown. Until proof to the contrary is forthcoming it must be assumed that the epidemic represented a very virulent form of the same disease which has spread throughout the world from time to time for many centuries, and numerous excellent records of which are available for study in medical literature. At the present time there is no exact diagnostic procedure which may be relied upon positively to differentiate epidemic influenza from severe 'colds' accompanied by fever,

cough and prostration, and frequently followed by pneumonia, such colds being due to a variety of well-known organisms. Nevertheless there are certain fairly characteristic symptoms in typical cases of epidemic influenza which at present justify a clinical diagnosis of that disease. Investigation by the State Department of Health of the many cases now being reported as epidemic influenza lead to the conclusion that a majority of them should not be so classed, as they lack the characteristic symptoms of that disease. On the other hand, it cannot be denied that sporadic cases of epidemic influenza are occurring in many communities throughout the state, the greater number of such cases, in proportion to the population, being reported from localities which were not heavily attacked during the epidemic, which fact, together with the great infrequency of recorded second attacks in the same individual, justifies the belief that the disease confers a more or less lasting immunity, and that therefore no extensive return of the epidemic is to be expected immediately. There is now fairly general agreement among investigators of epidemic influenza that the disease is spread by personal contact from one individual to another, in all probability in the very earliest stages. It is therefore highly desirable that persons presenting the symptoms should, in so far as possible, be isolated within their own rooms during the first few days of their illness. On the other hand, the extreme measures taken against the spread of the disease, which were put into force during the height of the epidemic, are not at the present time to be regarded as necessary or desirable."

Soldiers as Health Propagandists.

Washington, D. C.—The United States Government is losing no opportunity to aid in the campaign being carried on throughout the nation by the U. S. Public Health Service under Surgeon-General Rupert Blue, for the suppression of prostitution and the eradication of venereal diseases. Each soldier and sailor as he receives his discharge is urged to remember what he has been taught while in the service in regard to the dangers of venereal disease. The men are given a specially prepared pamphlet on the subject, and are asked to carry the Government's message of social sanitation back to their home town. Army and navy officers who have seen the practical value of the education on sex matters which has been given to all enlisted men are, in the opinion of the surgeon-general, particularly fitted to carry the propaganda against venereal disease back to their home communities, and a great many of the officers who have returned from abroad have signified to Surgeon-General Blue their intention of aiding in the work in their own states.

San Francisco Remasks.

San Francisco, Cal.—Following a recurrence of the epidemic of influenza, the board of supervisors has passed another ordinance ordering compulsory remasking. There has been considerable opposition to the plan and an anti-mask league has been formed. There are between five and six hundred new cases reported every day. The recurrence is reported throughout the West.

"Health Sunday" Proposed.

Washington, D. C.—Dr. Rupert Blue, Surgeon-General of the United States Public Health Service, has asked the ministers of the country to set aside February 9 as Health Sunday and to preach sermons emphasizing the responsibility of the nation to protect returning soldiers and sailors and the community at large, and to take vigorous measures for combatting venereal diseases. A proclamation by the Surgeon-General has been sent to all ministers, with the request that they read it from their pulpits February 9. It states that the government is asking the churches of the country to take an active part in meeting a great national emergency, and that the war made it necessary for the nation to face frankly and courageously the menace of the venereal diseases. "In the army and navy a program of law enforcement, medical measures, education and provision for wholesome recreation was adopted," Dr. Blue states. "This program brought results. Now that the war is over the cities and towns through which the soldiers and sailors will go and to which they will return upon demobilization must be made as safe as the camps from which they have gone. The fight against this menace to our national vitality and to our homes must be vigorously continued. It is the social responsibility of the communities, of which the churches of every denomination are a part, to continue the work carried on in time of war in order that the world may be made safe not only for democracy, but for posterity."

State Advertises in Newspapers in Disease Campaign.

Trenton, N. J.—Full page advertisements are being used in newspapers throughout the state by the Bureau of Venereal Disease Control of the state department of health in its campaign to awaken the state to the menace of the venereal diseases. The advertisements are prepared from material supplied by the U. S. Public Health Service and tell in clear language what the conditions are and how and why "The Country Must Be Kept Clean." Quotations from W. G. McAdoo, Newton D. Baker and Josephus Daniels are presented. The lessons of the war are described and venereal diseases are declared to be a peace problem as well as a war problem. The readers are told that "you can keep your red-light district closed and suppress commercialized prostitution of all kinds." Provision for treatment, education and wholesome recreation is urged. City officials and citizens are called upon to aid the work and all are urged to send for free literature on sex hygiene.

STREET LIGHTING AND POWER

Town Votes to Sell Electric Plant.

Howell, Mich.—At a recent special election held here on the lease, franchise and sale of the Howell electric light plant to the Detroit Edison Co., the proposition was adopted by a vote of 709 yes to 70 no. The sale will be made for a gross consideration of $50,000 and is to become effective at once. The electric light plant has been operated by the municipality in connection with the water works for about 30 years. Both men and women voted, but the vote was not a heavy one.

U. S. Order Stops Natural Gas Waste.

Charleston, W. Va.—Wasteful usages of natural gas, such as burning it all day to save the trouble of turning it off, are to be reported hereafter to the United States fuel administration, under a new order. Existing shortages of natural gas may be alleviated in some measure, fuel administration officials said, by the order, which says: "It shall be deemed wasteful to burn natural gas by means of flambeaux or open lights; to burn natural gas for the purpose of outside lighting during daylight hours; to burn natural gas in inefficient appliances; to burn more natural gas than is reasonably necessary for the purpose which it is intended to serve; or to consume natural gas in any other manner which is not reasonably efficient and economical. Licenses are hereby directed to report to the United States fuel administration all cases where consumers persist in the wasteful use of natural gas." The order was issued because of instances where natural gas was allowed to burn carelessly, even when under meter regulation, as well as for the guidance of so-called "free" consumers, whose gas costs them nothing, it was stated. Various attempts were made during the autumn to persuade "free" consumers to limit themselves to 200,000 cubic feet a year, but these were unofficial as regards the fuel administration. The natural gas situation has become steadily worse during the last few years. In many parts of the country it is critical. The losses in connection with use of natural gas are greater relatively than those of any other fuel. As an example, it was pointed out that last winter in Louisville, Ky., when the supply of natural gas failed, it was found that 1.9 per cent of the consumers were using 30 per cent of the natural gas. This was due in part to the consumption of natural gas in converted coal furnaces, a wholly improper appliance for burning natural gas according to fuel administration engi-

neers. Public utilities commissions are now prohibiting the use of natural gas in appliances not primarily constructed for such use. The so-called free gas feature has been especially troublesome and has resulted in depriving many domestic consumers of an adequate supply of best fuel available for household use. In an extensive investigation of the amount of gas consumed by domestic consumers in West Virginia having this so-called free gas service privilege (on account of having gas wells or gas lines on their farms), it was found that the average consumption per free consumer a year was 480,000 cubic feet. This is a waste of at least 350,000 cubic feet for each free consumer a year. There are at least 4,400 free consumers in West Virginia, and at this rate of waste this item alone amounts to 1,540,000,000 cubic feet a year.

Rate Increases Granted.

Los Angeles, Cal.—A decision recently made by the California state railroad commission grants a liberal increase in rates to the Southern California Edison Company. Coming with the opening of the new year and following several similar increases in rates granted to other public utility companies in California it is regarded as a significant development. Not only is the increase granted to the Southern California Edison Company liberal in terms, but the wording of the decision shows a sympathetic appreciation by the California railroad commission of the difficulties under which the public utility companies have been operating since the outbreak of the European war. The following is an extract from the opinion: "I am satisfied from the showing made that applicant, because of the increase in the price of materials and labor, is entitled to an increase of revenue, and that therefore rates to consumers must be increased, and I am also convinced that we will be acting with entire fairness to applicant, as well as to consumers, if we fix rates so as to put applicant in as good condition as it was before these abnormal increases in cost. If the rates set out in the attached order result, as expected, in restoring applicant to its pre-war financial condition it seems reasonable to anticipate that applicant will not be handicapped because of insufficient revenue in financing appropriate extensions and betterments." John B. Miller, chairman of the Southern California Edison Company, in commenting on the decision, said: "The increase in rates recommended by the investigating commissioner and unanimously agreed to by the other members of the California railroad commission will mean an annual increase in revenue of approximately $1,000,000. While this increase granted is gratifying to us, what is even more gratifying is the judicial spirit of fairness shown by the commission in its recognition of the difficulties of the abnormal conditions under which the public utility companies generally have been operating. Notwithstanding the various increases in rates granted by the railroad commission rates in California generally are lower than the average rates throughout the United States. This is due to the fact that a very large proportion of the load is carried by water power."

FIRE AND POLICE

Police Department Reorganized.

Indianapolis, Ind.—The reorganization of the police department, which went into effect at the beginning of the year, is now in full operation. There were changes in personnel, working hours, filing systems and important administrative reforms—besides a new attempt of the officials to make the work of the department more effective. Mayor Jewett, in a speech to the men, declared that while good work had been done by the department along certain lines, the department's record in regard to "blind tigers," gambling and prostitution had been anything but satisfactory. "I have been informed," said mayor Jewett, "that gambling has been going on in the very shadow of the city hall. Why is it that none of you patrolmen knew that that was going on? If there is any reason why any of you patrolmen—personal, political or otherwise—can not arrest any law violator within your district, then the thing for you to do is to take your badge to the chief of police and resign, because it is your business to enforce the law and if you can't do this you are not doing the duty the city has employed you to do. The merit system will be strictly adhered to under the reorganization plans. Every member of the department will have an opportunity to show what is in him. If you are interfered with by any influence or slowed down by any insinuation of a superior officer, the board of public safety wants you to go ahead and do your duty and your reports on your districts will determine your records, regardless of whose toes you step on." Mayor Jewett said he attributed a large part of the failure of many policemen to do their full duty in regard to the suppression of "blind tigers," gambling games and other forms of vice to the fact that they had been influenced to some degree by politicians. Such practices, if true, must stop immediately, the mayor said. The words of chief Coffin to the patrolmen and sergeants in a previous statement to the effect that they are to be held directly responsible for any law violations in their districts and divisions were emphasized by mayor Jewett, who pointed out that the man in whose district a gambling game, "blind tiger," resort or other law violation is found, will have to answer for it to the members of the board of safety.

Civil Service Eligible Lists Abolished.

Toledo, O.—The civil service commission, subject to the sanction of the director of law, has adopted a resolution abolishing the eligible lists of the police and fire divisions which were established during the recent period in which it was found necessary to modify the requirements and students as to fitness and eligibility. This action has been taken because a number of the members of these departments now on leave of absence are about to return to civil life after having completed their terms of enlistment in the army and navy. Also many applications for positions in these departments have been submitted to the director of public safety by returned soldiers and sailors "who by the very nature of their training and experience while in service are eminently fitted to perform the duteis of patrolmen and firemen—and further it being the opinion of this commission that it is the moral duty of all employers, especially during this great reconstruction period, to use every power to furnish lucrative positions for those valiant men."

Capital to Have Thirty Policewomen.

Washington, D. C.—Major Pullman, chief of police for the District of Columbia, has asked the United States Employment Service, Department of Labor, to obtain thirty policewomen for his force. His experiment in employing Mrs. Leola N. King as traffic officer has proved a success, and now, wherever most needed, he will place other women in the crowded streets to direct vehicles and safeguard life. And he has much other work for them to do. Mrs. King is the wife of Capt. E. H. King of the United States Medical Corps, and long has been interested in social problems. "We now have a women's bureau in the police department," says Major Pullman. "Two are college graduates and two have had training as nurses. One of my assistants is the sister of a United States Senator and another is a woman of wealth who desires to help. Mrs. Arthur B. Spingarn, who for several years was director of investigation in court work for the New York Probation and Protective Association, is head of the bureau. No woman need apply to the United States Employment Office for a place in our woman's bureau who does not have a social conscience and a desire to help humanity. For the woman who just wants a job we have no place. I want to elevate the standard of police work, so that it will attract women of good education and best ability. The problems that confront us are often so delicate and intricate that they can be properly handled only by trained women. Police work is something more than supplying a man with a club and telling him to go forth and put all the bad men

in jail. Our object is prevention rather than punishment, and it is because of the new appreciation of police ethics that the presence of women in police work is so necessary. It is the object of the woman's bureau to handle most of the crimes committed by women or against them, and to investigate conditions that place girls in danger. To this end the bureau has made a survey of conditions in Washington. In this survey have been included hotels, rooming places, boarding houses, rest-rooms, automobile services, burlesque shows, dance halls, movies, parks and playgrounds. Working conditions also have been investigated. We are co-operating with all the existing agencies in Washington that are concerned with the rehabilitation of wayward girls. We have on file the record of every girl brought to our attention. The first time a girl commits larceny we are interested even more in the conditions that led to the commission of the crime than we are in the culprit, because it is only by making a study of these conditions that we can hope to prevent a similar offense. We have a large detention-house, which we expect to remodel so as to keep juvenile offenders apart from immoral girls. Some of the things that I shall require of the thirty policewomen whom I am asking the United States Employment Service to secure are to discover conditions needing correction, to supervise amusement places, to aid in locating runaway girls, to follow girls and warn them of danger, to befriend girls whose home life does not afford protection of the right sort, and to do personal work with women and girls."

Two Firemen Killed in Collapse.

New York, N. Y.—A three-alarm fire at a truck delivery garage resulted in the death of two firemen and the serious injury of three others. Many other firemen had narrow escapes from being trapped and losing their lives when the walls caved in. The men who were killed were on the roof of a shed just behind the burning two-story building. They had no more than climbed up when the rear wall of the burning structure collapsed and buried them in an avalanche of hot bricks. Every effort was made to save the men; streams of water were played on the burning debris and the firemen tried to jack up the beams which pinned their comrades down, and after great effort, they succeeded in extricating one. For more than an hour the rescue party worked to free the other two men.

GOVERNMENT AND FINANCE

Ohio Cities Organize For Financial Relief.

Columbus, Ohio.—Mayors of thirty leading Ohio cities have met here and set up an organization which will go before the legislature with a definite program of taxation so far as relief of cities is concerned. The meeting was presided over by mayor Davis of Cleveland. Representatives of cities plan to enlist the chambers of commerce of the state in their relief campaign. As the result of the discussion city manager Barlow of Dayton has drafted and submitted a tentative draft for a proposed law which it is believed will bring the desired financial relief to the cities of the state. Copies of the draft have been sent to the city solicitors of the various municipalities with the request that they look it over and make further recommendations. A summary of the suggestions that are received by city manager Barlow will be incorporated into a measure which is being prepared by the city attorney of Dayton and will be submitted to the state legislative body. The committee in charge of the construction of the bill consists of J. E. Barlow, city manager, Dayton; F. L. Biggs, director of public service, Ironton; W. H. Brown, city attorney, Cambridge; George E. Caylor, city solicitor, Delaware; J. S. Martin, Toledo; C. J. Neal, finance director, Cleveland; Kenyon Riddle, city manager, Xenia; B. F. Robinson, president of council, Bucyrus; Stewart L. Tatum, attorney, Springfield; E. L. Weinland, member of council, First National bank building, Columbus; Saul Zielonka, city solicitor, Cincinnati. The tentative recommendations submitted by Mr. Barlow are:

To permit issuing of bonds, as to which a vote of the people is required, upon approval of a majority of electors voting at the election instead of two-thirds, as at present.

To permit levies for sinking fund and interest on all bonds, heretofore or hereafter made, outside of the ten-mill limitation.

To abolish all limitations on tax levies for sinking fund and interest on bonds and additional tax levies authorized by a vote of the people.

To authorize municipal legislative bodies to levy taxes for a limited period to pay deficiencies when approved by a body independent of the municipality, such as the state tax commission, and to anticipate such levies by borrowing within the amount to be raised thereby; to be made effective for immediate relief of cities having existing deficiencies.

To amend the constitution as to secure representation of cities upon county budget commissions.

To fix maximum limitations upon levies to be made by tax levying authorities, which shall not be subject to review by the budget commission, each unit to keep within its own limitations and the total to be within an aggregate maximum.

A direct inheritance tax law.

A state income tax law.

An occupational tax.

An occupational tax graduated according to profits earned.

Means to secure 100 per cent valuations on all property, especially realty.

A poll tax in addition to property tax.

A payment of part or all of automobile license fees to cities.

Taxation of church property.

Requiring tax returns to state amount of fire insurance carried on personal property returned.

Prosecution of violations of municipal ordinances rather than state laws covering misdemeanors.

Combination of city and county government in counties where city population predominates.

A tax on foreign fire and liability insurance companies, for the benefit of firemen's pension funds.

The committee will become a permanent organization to meet at stated intervals to discuss municipal problems.

Ready Market For Conservancy District Bonds.

Dayton, O.—The National City Company, the Guaranty Trust Company, and Harris, Forbes & Co., all of New York City, have announced the purchase and sale of $5,000,000 Miami Conservancy District, Ohio, 5½ per cent bonds. The subscription books were closed a short time after the offering was made. The bonds mature from 1927 to 1946. They were offered at prices ranging from 103.56 to 107.481. The total outstanding debt of the district, including the new issue, is now $30,000,000 against an assessed property valuation of property against which benefits have been appraised of $1,194,816,600.

New York Governor Appoints Reconstruction Commission.

Albany, N. Y.—Governor Smith, in a special message to the legislature has named a reconstruction committee which will attempt to solve the post-war problems facing the state. The committee comprises thirty-six members, and includes some of the most influential men and women in the state. There are five women members. Abraham I. Elkus, of New York, has been chosen chairman, at the request of governor Smith. In his message the governor outlined the duties and powers of the commission. The members will serve without compensation, but the governor asks the legislature to appropriate $75,000 for payment of necessary clerical assistance. Among the chief problems put up to the commission by governor Smith are, the immediate examination of the state military training laws; housing conditions of the state, taxation, food problems with a view to increasing the productive and distributive facilities of the state and lowering the cost of foodstuffs; employment; public health and the necessity of speeding up public works to meet unemployment conditions. The governor announced his intention of bringing other reconstruction problems to the attention of the commission as they arise. The commission is empowered to create for its own use advisory bodies and local branches wherever such are found useful. The governor requests all social and civic organizations to place at the disposal of the commission any information or recommendations concerning problems under consideration. The services of any state department or of experts on the faculty of any state university are placed at the disposal of the commission by governor Smith. The commission is asked, as one of its first duties, to examine the laws passed as emergency measures, the appropriations made for the work required by these statutes and the expenditures made under them.

Food of every kind should be made available at decreased prices, the governor contends in commissioning the board to study these problems, "with a view to capitalizing for permanent use the lessons the war has brought home to us and increase the productive and distributive facilities of the state in cooperation with state and local agencies organized for similar purposes." Co-ordination of state resources with federal, municipal, and private resources is most important, the governor urges, in the solution of the employment problem. The public is requested to apprise the commission of unemployment that may come to its attention. The commission also is committed to dealing with any labor crisis which may arise during the period of readjustment. The federal proposal, as embodied in what is known as the "Soldiers' Settlement Act," will be considered by the commission, as will the suggestion of Secretary of Labor Wilson, that necessary public works be speeded up to meet unemployment conditions. In concluding his message the governor said: "More than all I enjoin upon the commission such speed as may be consistent with thoroughness, in order that situations demanding immediate relief be remedied as soon as possible. The commission is directed to utilize all available material in the possession of special agencies or state departments to this end. I shall rely upon the commission for advice and counsel in all of the matters mentioned, and shall hope to receive early reports of progress and recommendations for action." Mr. Elkus served as counsel to the New York State Factory Investigation Commission; ambassador to Turkey, and a member of the State Board of Regents. The other members include Bernard M. Baruch, formerly chairman of the U. S. War Industries Board; Dr. Felix Adler; Charles P. Steinmetz, inventor and electrical expert of the General Electric Co., and for many years alderman of Schenectady; Alfred J. Johnson, formerly city chamberlain of New York City; Dr. Henry Dwight Chapin, well known New York City physician and especially interested in child welfare work; representatives of the State Federation of Labor; V. Everit Macy, chairman of the Shipbuilding Labor Adjustment Board; L. J. Lowell, president of the State Grange; Alfred E. Marling, president of the State Chamber of Commerce; prominent bankers, business and professional men.

All Banks in City Designated as Fund Depositories.

Omaha, Neb.—All the banks in Omaha have been designated 1919 official depositories for city funds by the city council. The operation of "advertising for bids for city funds" was declared at a meeting of council to be a farce. Only one bank responded to the advertisement. This was the Merchants' National bank and it made a bid of 2 per cent, which is the minimum rate established by statute. The city funds will be distributed as heretofore among all the banks at 2 per cent interest. A rate of 3 per cent can be secured on time deposits, commissioner of finance Ure said, but the funds fluctuate so much that it is not practicable to make time deposits. "The state gets 5 per cent on some of its money in some banks out in the state," said Mr. Ure. "And we could get that rate, too, if we wanted to go out in the state with any of our funds. Under the present law we cannot deposit money outside of the county." The city funds go up and down in a wide range. Soon after July 1 they are up in the millions and toward the end of the fiscal year they drop to almost nothing.

STREET CLEANING AND REFUSE DISPOSAL

Charges for Garbage Collection Increased.

Spokane, Wash.—Service prices of the city crematory have been raised by superintendent Arthur Peterson, and have been officially authorized by the city commissioners. A letter from Mr. Peterson to users of the crematory blames the increase on the wage and salary increases and the increased cost of supplies required in crematory work, the expenses of operating the crematory division. The prices for monthly service—where receptacles are placed in an accessible position—remain the same as at present. Where men are required to carry cans any considerable distance or from basement or from upper floors, an additional charge is made. New contracts based on revised prices will be required where cans are inaccessible. The superintendent suggests that building owners who have loads hauled instruct their engineers or janitors to assist the crematory crews in loading waste materials. By this method only one crematory man would be required and a considerable saving in hauling costs would result. The new rules for the crematory read in part:

"The owner or occupant of each household or business concern, producing waste, is required to provide separate and proper receptacles to hold garbage.

"Put into garbage can all animal and vegetable refuse from the kitchen, rags, waste paper, old shoes, rubbers, floor sweepings and miscellaneous refuse that will burn.

"Put into ash can all ashes, tin cans, glassware, crockery, and all miscellaneous refuse that cannot be burned.

"To have a clean can at all times, it is suggested that edible kitchen wastes be kept separate and fed to chickens and balance of waste be drained, then wrapped in paper before placing in can.

"Send all orders for service and report all service complaints to crematory division, phone Main 7119.

"The prices cover service, when cans are placed in a position on the ground floor of premises, easily accessible to the collector. An extra charge based on the situation is added when cans are placed on any floor above the second.

PRICE SCHEDULE.

One 30-gallon can, collected each week	$1.00
One 15-gallon can, per month	1.00
Two 30-gallon cans, per month	1.75
One load ashes or rubbish	3.00
Three 30-gallon cans, per month	2.50
Four 30-gallon cans, per month	3.25
Five 30-gallon cans, per month	4.00
Six 30-gallon cans, per month	4.75
Fifty or more 30-gallon cans, per can	.15
(All waste materials collected under miscellaneous service must be placed at curb or easily accessible.)	
Decaying vegetable matter in lots of 1,000 pounds or more, collected from commission houses or order, per 100 pounds	.20
One load boxed or baled paper	2.50
Less than load paper, rubbish or ashes, per cubic yard	1.15

Garbage Handling Profitable.

Indianapolis, Ind.—In a report to mayor Charles W. Jewett the board of sanitary commissioners points out that in the last seven months the total net income from the municipal garbage reduction plant, which was taken over by the commissioners, May 25, 1917, has been $14,896.99. The report shows that for the last seven months the total operating revenue was $87,427.23, made up as follows: Grease production, $63,665.63; garbage tankage, $19,502.17; hides, $4,259.43. The operating expenses totaled $50,327.20 as follows: Plant operating expense, $36,370.69; collecting department expense, $7,090.26; purchase of waste meat and grease, $1,354.94. Deduction of the total operating expense from the total income, the report shows, gives a gross income of $37,100.03. From this $17,500 is deducted for the depreciation fund and $4,703.13 is deducted for interest on bonds, leaving the net income of $14,896.90. The reduction plant was bought for $175,000 from the Indianapolis Reduction Company, which had the contract for garbage collection for a number of years. The commissioners say in their report that at the rate of profit for the last seven months the plant will pay for itself in five years and that the net profit represents a return of 8.5 per cent. on the original investment of $175,000. The commissioners also say that a saving of approximately $37,000 a year has been effected in the collection of garbage, which is taken care of by the board of public works, as the total cost of collection in the seven months has been $29,765.81, or at the rate of approximately $51,000 a year, while the only bid for the collection of garbage was $87,900. Thus, the commissioners point out, a great saving has been made on collection costs and at the same time a substantial profit is being obtained from the operation of the plant itself. In explanation of the item of expense listed as "collecting department expense, $7,090.26," Frank C. Lingenfelter, president of the board of sanitary commissioners, said this represented what the sanitary board had paid for feed and care of teams. The major part of the collection cost is in wages, Mr. Lingenfelter said, and that expense is borne by the board of works, the board of works thus far having paid out $29,765.81 for this work.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Sewer Assessment—Land Already Drained.

(Ohio) Where plaintiff's lands were adequately provided by street sewer with drainage, he is not liable to assessment for the construction of another sewer which renders no service and is no benefit to the premises.—City of iCncinnati v. Doerger, 120 N. E. 304.

City Payment for Railroad Crossing Guards—Police Power.

(Fla.) Where a city receives from a railroad valuable property and other benefits in removal of switching operations, on consideration that city would bear the expense of operating guards at crossing, it is not a contract bartering away its police power.—Florida East Coast Ry. Co. v. City of Miami, 79 So. 682.

Undertaking Business in Residence Street—Power of Restriction.

(La.) Municipal authority to prohibit location and maintenance of establishments where any unwholesome business is carried on and to restrict them within certain limits includes authority to prohibit undertaking business on residence street, where not theretofore conducted.—Osborn v. City of Shreveport, 79 So. 542.

Without any prohibitive ordinance, an undertaker may be prevented from establishing his business among residences where such business has not theretofore been conducted.—Id.

Failure to Complete Contract on Time—Bonding Company Liability—Liens.

(Idaho) A provision, in a bond for performance of a construction contract, that the contractor shall pay all expenses that the village and its engineer may be put to by failure to complete on time, does not create liability for engineering services prior to the breach of the contract.—Village of Council v. United States Fidelity & Guaranty Co., 175 P. 44.

In an action on a bond for performance of a construction contract, where there is sufficient evidence that certain items are lienable, the liens and evidence of payment by the plaintiff are admissible.—Id.

In action on bond on construction contract, testimony that certain sums were expended by the obligee in completing the contract in accordance with the plans makes a prima facie case against the bonding company.—Id.

Mill Constructed Before Town Incorporated—Power to Regulate.

(Or.) Act 1898 (L. Q. L. § 3229) conferred upon cities and towns incorporated under its general police power to regulate the use of private property, and a mill constructed without a license before incorporation of town, in what was then a county road, and which is now maintained along and across a street, is no exception.—Town of Gaston v. Thompson, 174 P. 717.

The existence of an open millrace in the principal thoroughfare of a town primarily affects the local situation, and is within scope of authority of cities and towns, under Const. art. 11, § 2, empowering the legal voters to enact and amend their charters.—Id.

Requiring defendant to keep millrace maintained along a street of plaintiff, to be covered with planks sufficient for ordinary travel, is a reasonable exercise of the police power committed to plaintiff by Statute 1893 (Laws 1893, p. 119), and reasserted in initiative charter (April 14, 1914), and is properly classified as local, special, and municipal legislation, under Const. art. 4, § 1a, reserving initiative power to voters.—Id.

Street Depression Filled with Water—Liability for Sickness.

(S. C.) Civ. Code 1912, § 3053, making city liable for bodily injury or damages to person or property through defect in street by reason of mismanagement, does not render city liable to property owner made ill by depression in street filled with stagnant water.—Triplett v. City of Columbia, 96 S. E. 675.

Paving Specifications—Separate Rolling of Courses.

(Iowa) Under paving contract specifying three courses of crushed stone of six, four, and two inches, "thoroughly rolled and compact," or "thoroughly rolled" to engineer's satisfaction, contractor had to roll each course thoroughly compact, and not merely to reduce all courses to ten inches after rolling, as shown in blue print measurements.—Ford v. City of Cedar Rapids, 168 N. W. 870.

Street Lighting Contract—Lamp Size Reduction.

(Wash.) Under a contract to furnish city street lighting should continue during the contract term, except that its position might be changed at the city's expense, and further that the size of lamps might be changed, but that the company, refusing to reduce the size of lamps as ordered by the city, might recover on the basis of the size of the lamps established.—Puget Sound International Ry. v. City of Everett, 175 P. 40.

Pollution of Creek by Gas Company Waste—Prosecution.

(Mo. App.) Where the discharge of waste water by a gas company into a creek constitutes a public nuisance because it destroys the fish and pollutes the water so as to be injurious to public health, the prosecuting attorney may enjoin such nuisance under the statute.—St 'e ex rel. Wear v. Springfield Gas & Electric Co., 204 S. W. 942.

Where a gas company pollutes the waters of a creek by waste so as to destroy the fish therein, the prosecuting attorney may enjoin such pollution, Rev. St. 1909, § 6508, vesting title to the fish in the state, and section 1007 directing prosecuting attorneys to prosecute all actions in which the county or state is concerned.—Id.

The authority to prosecute a suit to enjoin pollution of a stream is not exclusive in the prosecuting attorney; Rev. St. 1909, § 970, authorizing the Attorney General to institute such proceedings.—Id.

In a suit to enjoin a gas company from polluting a stream, evidence held not to show that defendant was discharging deleterious substances into the stream in such quantities as to destroy the fish.—Id.

Waterworks Bond Issue Election—Validity.

(N. M.) Where an election on a bond issue in the main conforms to the requirements of the statute, though wanting in particulars not essential to power to hold election, and is acquiesced in by the people, such irregularities did not render the bonds so issued void.—City of Albuquerque v. Water Supply Co., 174 P. 217.

City council's submission to voters of a proposition to issue bonds to purchase or erect a system of waterworks is not a double proposition, but is to be construed as a proposition to acquire a waterworks system either by purchase or construction.—Id.

A notice of a city's election to vote on a bond issue, published once a week for four consecutive weeks, the last insertion being 13 days before election, substantially complies with Code 1915, §2717.—Id.

Mere irregularities in notice will not, of itself, invalidate a city election on the issuance of waterworks bonds, but it must further be shown that a strict compliance with the statute would have made a different result.—Id.

Bonds properly signed by city officers at the date of signing the bonds were not rendered invalid because the sale of the bonds were not concluded by such officers but by their successors in office.—Id.

Laws 1915, c. 74, requiring approval of state tax commission to proposed increase of municipal tax rate, has no application to levies to provide bonds for payment of the principal and interest on the bonded indebtedness.—Id.

NEWS OF THE SOCIETIES

Feb. 25-28, 1919.—AMERICAN ROAD BUILDERS' ASSOCIATION. Sixteenth annual convention and Ninth American Good Roads Congress under the auspices of the A. R. B. A., Hotel McAlpin, New York, N. Y. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

Nov. 12-14, 1919.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

American Road Builders' Association.

The ninth American Good Roads Congress and the sixteenth annual convention of the American Road Builders' Association will be held at the Hotel McAlpin, Broadway and 34th street, New York City, February 25, 26, 27 and 28, 1919.

It is proposed to bring together those most prominently identified with highway construction, transportation and maintenance for the purpose of considering the questions of the hour.

The program which is now being prepared for the eight sessions of the congress will be devoted to the consideration of highway transportation and the administration, financing, construction and maintenance of national, state, county and municipal highways. Papers by prominent highway authorities and reports on live topics by several committees will be presented for discussion. The general plan contemplates devoting February 25 and 26 to the presentation and discussion of papers, and February 27 and 28 for the consideration of reports to be submitted by several committees. The business session of the association will be held on the afternoon of February 28, and the annual banquet on the evening of the 26th or 27th. It is proposed to show motion pictures pertaining to highways on two evenings during the congress.

Among the subjects which will be presented for discussion are the following:

National Highways and Federal Aid for State Highway Improvements.

Relation of Highways to Railways and Waterways.

Efficient Methods of Contracting for Highway Work During the Reconstruction Period.

Efficient Methods of Promoting Highway Bond Issues.

Efficient Methods of Drainage for Different Geological Conditions.

Foundations for Heavy Horse-Drawn and Motor-Truck Traffic.

Methods of Maintaining Highway Systems Prior to Construction by the State or County.

Economic Utilization of Labor-Saving Machinery.

Cost Keeping for Highway Contractors.

Street Systems, Their Relation to Highways Outside of Urban Districts.

The Efficiency of the French Broken Stone Roads During the War.

Efficiency of Bituminous Surfaces Under Motor-Truck Traffic.

Recent Developments in the Construction, Maintenance and Reconstruction of Cement-Concrete Pavements.

Present Status of Brick Pavements Constructed With Sand Cushions, Cement Mortar Beds and Green Concrete Foundations.

Recent Practice in the Construction of Stone Block Pavements.

Committees will submit reports on the following topics:

Regulations Covering Speed, Weight and Dimensions of Motor Trucks.

Methods of Financing Highway Improvements for States, Counties and Towns.

Civil Service Requirements for Highway Engineering Positions.

Sources of Supply of Unskilled Labor for Highway Work.

Convict Labor on Highway Work: Organization, Administration, Camps and Cost Data.

Reconstruction of Narrow Roadways of Trunk Highways With Adequate Foundations and Widths for Motor-Truck Traffic.

Methods of Strengthening and Reconstructing Highway Bridges for Heavy Motor-Truck Traffic.

Efficient Methods of Snow Removal from Highways Outside of Urban Districts.

Guarantees for Pavements on Roads and Streets.

Uniform Highway Signs.

Next year it is proposed to hold, in connection with the convention, the most complete and comprehensive exhibit of road machinery, equipment and materials ever seen. At the time, however, it was decided to hold this year's convention in New York City, the war was still in progress, and it was felt to be out of the question to have an exhibition on anything approaching a large scale. It was therefore decided to limit this feature to the facilities afforded in the Winter Garden, on the top floor of the Hotel McAlpin.

The sessions of the convention will be held in the ballroom, which is also located on the top floor and adjoins the Winter Garden.

New England Water-Works Association.

At the annual meeting of the New England Water-Works Association, held in Boston January 8, Carleton E. Davis, retiring president, in his address, urged more recognition of both the younger and the associate members. Mr. Davis touched on services rendered by water-works during

(*Continued on page* 100)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Preliminary plans have been prepared for a PARK and PLAY GROUND, including a small concrete bridge, by the city of Lorain, O. The consulting architect is M. J. Horvath.

Belfield, N. D., is to build a WATERWORKS SYSTEM, including reinforced concrete reservoir, pump house, etc. The consulting engineer is L. P. Wolff.

A WATERWORKS DISTRIBUTION SYSTEM is being planned by the city of East Alton, Ill. The plans are being prepared by the architects, Sheppard & Morgan.

A highway and trolley BRIDGE is to be built over the Housatonic river between Stratford and Milford, Conn., by the State of Connecticut. The consulting engineering firm is Waddell & Son.

A MUNICIPAL PIER which will include ferry boat landing and pavilion is to be built by the city of Wyandotte, Mich., according to plans being prepared by the consulting engineers, Mason L. Brown & Son.

Preliminary plans have been prepared for a DRAINAGE SYSTEM, consisting of ditch and levy work, by the Ray county drainage district, Hardin, Mo. The consulting engineers are the C. E. Jacoby Engineering Co.

PAVING IMPROVEMENTS are to be made by Monroe, Wis., involving approximately twenty-six blocks. The consulting engineer is John F. Icke.

Woodlawn, Pa., is to build a SEWAGE DISPOSAL PLANT according to plans prepared by the consulting engineer, R. Winthrop Pratt.

WATERWORKS IMPROVEMENTS are planned by Lockport, N. Y. The consulting engineers are the firm of Hill & Ferguson.

A WATER DISTRIBUTION SYSTEM is to be built by the town of Princess Ann, Md., according to plans prepared by the consulting engineer, L. J. Houston.

A WATER SYSTEM, including reservoir, pumping station and filter plant, is contemplated by the city of Gillespie, Ill., according to plans prepared by the consulting engineering firm of Miller, Holbrook & Warren.

WATERWORKS IMPROVEMENTS are to be made by the city of Prescott, Ariz., involving the reconstruction of the distribution system and building of new water system, to include storage reservoir, distributing reservoir, canal, headgate and supply pipe line. The estimated cost is about $300,000. The consulting engineer is H. Phillips.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

RESPIRATORS AND MASKS.

For Protection Against Dust, Smoke, Fumes, etc.

The increasing attention paid by municipal departments and public utility companies to the safety of employees is being extended to protection from the hazards due to dust, smoke, poisonous gases, acid fumes and similar harmful agents. Fire departments, street cleaning departments, garbage plants, emergency stations, gas companies, etc., find important uses for respirators and masks for such protection.

The Diamond standard respirator is made of white rubber, moulded in one piece in a shape to fit the face of the wearer without interfering with the vision or with the wearing of eye protectors. A fine filtering sponge and gauze filter in front is provided for extracting the most minute impurities from the air. The standard respirator is also equipped with an aluminum protected outlet valve to allow easy and natural breathing. An elastic headband is provided for quick adjustment. The respirator may be cleaned by holding it under the faucet.

The Diamond aluminum respirator is the same in principle and design as the standard device, but the body is made of aluminum. It is equipped with a pneumatic rubber cushion and release valve. This respirator is intended for heavy duty and service conditions.

The aluminum respirator forms the respirator part of the Diamond respirator mask—a combination of mask and respirator. The body of the mask is made of brass, nickel-plated. The eyepieces are carefully ground. A pneumatic face cushion with outlet valve is designed for comfortable, gas-tight contact between face and mask. This mask is now in use in the street cleaning department of San Antonio, Tex.

The "Dustite" respirator is made of white rubber, with aluminum ring for holding the gauze filter. All parts are separately renewable. It is fitted with detachable straps and is so made as to allow quick removal and replacing of filter. The filter is made of special material. This respirator has been tested and approved by the Underwriters' Laboratories.

This line of respirators, examples of which are shown in the accompanying illustrations, is made by the Safety First Supply Company.

"Dustite" Respirator.

Respirator Mask.

Standard Respirator.

Aluminum Respirator.

RESPIRATORS AND MASKS.

INDUSTRIAL NEWS

Drop in Cast-Iron Pipe Prices.—Following the reductions in pig-iron prices the prices for cast-iron pipe have also been revised downward. The reduction is $5 per ton in Chicago and the Central West, and now also in the East. The market, owing to limited buying of municipalities, has not been tested. These prices are therefore not regarded as bottom, and will be tested as soon as business of any importance develops. While manufacturers state that prices will be regulated by that of pig iron, buyers point out that the price of scrap should also be considered. Quotations: New York, 6-inch and heavier, $62.70; 4-inch, $65.70; $1 additional for Class A; Chicago, 6-inch and heavier, $61.80; 4-inch, $64.80.

"Chlorine Control Apparatus."

This is the title of a new catalog issued for general distribution by Wallace & Tiernan Co., Inc., 349 Broadway, New York, N. Y. The development of chlorination is described and its advantages enumerated. The principles and methods of chlorine treatment of water and sewage are explained with charts and diagrams. The illustrations show installations of the Wallace & Tiernan equipment and diagrams of the various types of apparatus.

Lime Association Postpones Meeting.

The annual meeting of the Lime Association, which was to have been held February 12 and 13 in Pittsburgh, has been indefinitely postponed.

The executive committee of the association, at its meeting in Washington, felt that an annual meeting so soon after the organization of the association would be premature, and unanimously agreed that the annual meeting ought to be held in June because of the labor and expense of such a meeting.

The Lime Association has been in operation less than seven months. During four and one-half months of that time its activities along promotional lines were discouraged by the War Industries Board, and practically all of the work done by the association during that period was in behalf of the War Service Committee and in securing priorities and preferences for

members. The programs planned in each of the three bureaus of the association since restrictions on promotional work were removed by the War Industries Board are now actively under way. These three programs look directly toward the immediate increase of lime tonnage.

The executive committee has adopted as a watchword "Economy and Tonnage" at this time, and wishes the members of the association to know that it was in the interests of these two necessary considerations that it has recommended to the directors, who have ratified the action, that the annual meeting be postponed.

Kentucky Crushed Stone Association.—At a meeting of the leading stone crushers of Kentucky at the Seelbach Hotel, Louisville, the Kentucky Crushed Stone Association was recently organized. The organization is composed of quarry operators who operate crushing plants for furnishing crushed stone for building, railroad, highway and other construction, and any crusher operator is eligible to membership.

The plans of the association are to unite the trade on a firmer basis. It is planned to bring about greater cooperation and better maintenance of markets, better methods of quarrying, interchange of information concerning machinery and quarrying in general, and in such matters as freight rates, deliveries, coal supply, general supplies, labor and selling terms.

NEWS OF THE SOCIETIES

(Continued from page 98)

the war and the opportunities for still further service during the reconstruction period.

The election of officers resulted as follows: President, Samuel E. Killam, superintendent of pipe lines and reservoirs, Metropolitan Water-Works, Boston; secretary, Willard Kent, Narragansett Pier, R. I.; editor, Henry A. Symonds, consulting engineer, 70 Kilby street, Boston; treasurer, L. M. Bancroft, Reading, Mass. All but the president were re-elected.

Oklahoma Utilities Association.

The Oklahoma Utilities Association will hold its annual convention in Oklahoma City, Okla., February 6, 7 and 8. Many interesting features have been arranged for the occasion.

One of these will be an exhibition of articles and apparatus of interest to utilities by the various manufacturers. A limited amount of space will be available for exhibition purposes, for which no charge will be made. Manufacturers of such apparatus who desire to be represented at the convention may reserve suitable space by communicating with J. O. Kammennan, Oklahoma Utilities Association, State National Bank Building, Oklahoma City.

PERSONALS

Rodgers, Hugh, has been appointed city engineer of Salem, Ore.

Gillespie, Richard H., formerly chief engineer of the Borough of the Bronx, New York City, has been appointed chief engineer and general manager of the Dewey Cement-Gun Construction Company, with headquarters at Allentown, Pa.

Atwood, B. M., has resigned as state engineer of Arizona, and will probably enter the contracting business, specializing in highway construction.

Butler, Captain A. D., Corps of Engineers, U. S. A., returned recently to his duties as city engineer of Spokane, Wash.

Dodd, J. S., assistant road engineer of the Iowa highway commission, who has been taking the place of Major T. R. Agg as professor of highway engineering, Iowa State College, during the absence of the latter in the army, has resigned and has returned to his duties with the commission. Major Agg has reassumed his teaching duties as professor of highway engineering.

The following appointments have been made by Mayor Mount, of Burlington, N. J.: city clerk, Walter W. Marrs; street commissioner, James McFadden; superintendent of the alarm, Elmer Gares; water commissioner, Selden Prokasco.

BOOK REVIEW

AMERICAN HIGHWAY ENGINEERS' HANDBOOK. By Arthur H. Blanchard, editor-in-chief, and seventeen associate editors. 1658 + XXV pages. John Wiley & Son. $5.00 net.

This "handbook" is in fact an encyclopedia of highway engineering, published in handbook size (4¼ by 7) and with flexible binding. The reliability of the information given and of the opinions expressed is guaranteed by the character of the authors. Prof. Blanchard, in addition to acting as editor in chief, has written chapters on "Terminology of Highway Engineering," "Bituminous Surfaces," "Bituminous Macadam Pavements," and "Bituminous Concrete Pavements." Harold S. Boardman, dean of the College of Technology, University of Maine, wrote the chapters on "Mathematics, Mechanics and Structural Materials" and "Highway Bridges, Culverts, Retaining Walls, Foundations and Guard Rails." James F. Kemp, Professor of Geology, Columbia University, and Frederick K. Morris, instructor in the same department, wrote the chapter on "Engineering Geology." W. W. Crosby, formerly chief engineer Maryland State Roads Commission, prepared the chapters on "Preliminary Investigation," "Brick Pavements" and "Cement-Concrete Pavements." Henry B. Drowne, formerly instructor in Highway Engineering at Columbia University, prepared the chapters on "Surveys and Office Practice" and "Planning of Roads and Road Systems." Nelson P. Lewis, chief engineer of the Board of Estimate and Apportionment, New York City, was author of the chapters on "Planning of Streets and Street Systems" and "Financing of Highway Improvements." Austin B. Fletcher, engineer of the California Highway Commission, prepared the chapter on "Grading, Drainage and Foundations." Joseph Hyde Pratt, secretary North Carolina State Highway Commission, wrote the chapter on "Earth and Sand-Clay Roads." Charles J. Bennett, state highway commissioner of Connecticut, the chapter on "Gravel Roads." Arthur W. Dean, chief engineer of the Massachusetts Highway Commission, the chapter on "Broken Stone Roads." Prevost Hubbard, chemical engineer U. S. Office of Public Roads and Rural Engineering, the chapter on "Bituminous Materials." John R. Rablin, engineer of Metropolitan Park Commission of Massachusetts, "Dust Prevention by the Use of Palliatives." Francis P. Smith, consulting chemical and paving engineer, "Sheet Asphalt and Rock Asphalt Pavements." George W. Tillson, formerly consulting engineer to Borough President, Brooklyn, N. Y., "Wood Block Pavements," "Stone Block Pavements," "Car Tracks and Pipe Systems," and "Comparison of Roads and Pavements." William H. Connell, formerly chief of Bureau of Highways and Street Cleaning, Philadelphia, "Street Cleaning, Collection and Disposal of Waste, Snow Removal" and "Organization and Administration of Highway Departments." Mark Brooke, Colonel of Engineers, U. S. A., "Sidewalks, Curbs, Gutters and Highway Signs." Henry A. Gardner, assistant director, Institute of Industrial Research, "Preservation of Materials Used in Highway Structures."

The above enumeration of chapter titles gives an idea of the exhaustive character of this book. Every phase of the planning, construction and use of both country roads and city streets seems to be covered. In fact, it seems to us that the book could have been shortened slightly by omitting a few subjects, such a garbage disposal, without detracting from its value to the highway engineer. But such not strictly pertinent matters occupy comparatively few pages.

The 78 pages of Index is unusually well arranged. The book contains a great number of tables and diagrams, but is notable by the absence of halftones—a commendable economy of space that is unusual in modern books. The diagrams and other line drawings number 607, and there are 369 tables.

This book is by far the most comprehensive collection of principles and facts concerning highways and streets that has ever appeared in any form, so far as we know, and will be of great value to every engineer whose work lies in this field.

Municipal Journal

Volume XLVI NEW YORK, FEBRUARY 8, 1919 No. 6

STREET CLEANING METHODS

Sweeping by Machine and Hand, Flushing and Sprinkling, and Other Street Cleaning Operations Discussed in Report of Rochester Bureau of Municipal Research—Patrol Routes—Equipment and Its Use.

Two things stand out as fundamental to economic success in street cleaning—effective organization, and application of scientific engineering principles to the development of work methods and to the design and use of equipment. The latter division of the subject forms Part II of a report by the Rochester Bureau of Municipal Research,* submitted at the request of the Commissioner of Public Works, which is given in quite full abstract herewith.

STREET DIRT.

The demands of a proper removal of refuse from the street surface require that the dirt be picked up at or as near as possible to its point of origin in the street, not being pushed along by broom or scraper and smeared over clean places; and that it be collected as near the time of origin as possible and not be allowed to blow around and be spread over the pavement by vehicles. The origin of street dirt of various kinds, possible means of decreasing its amount and ordinary methods for laying or removing it are given in the accompanying table. Other occasional sources of dirt are the placing of building materials in streets, dirt thrown from roofs and windows, street repairs and excavations, refuse barrels set out for collection, and sweepings from sidewalks.

Poor pavements of any kind are a source of much dirt, and increase the difficulty of removing it. In 1915 (more recent figures are not available) the cost of cleaning pavements in Rochester was as shown in the accompanying table.

Street cars are a source of considerable dirt and the tracks interfere with effective cleaning. The sand used on the rails makes fine dust. Smoke also makes appreciable deposits, it having been calculated that in the closely occupied area of New York 575 tons of cinders and soot are deposited per square mile per year.

*For an abstract of Part I, see Municipal Journal for January 18th.

A large amount of litter is due to the throwing into the roadway of papers and rubbish from stores and fruit stands. In the residential districts, grass, trimmings from shrubs and trees, leaves, etc., are thrown into the gutter for city collection, contrary to ordinance requirements. Using the pavement as a mixing board for concrete and mortar results in rough, unsightly spots that are difficult to clean.

HAND SWEEPING.

Any standard of cleanliness must be more or less arbitrary because, theoretically at least, if there is any dirt on a street, that street is not clean. But in applying a standard of cleanliness to street pavements swept by hand, the fine dust should not be taken into consideration, because it cannot be removed by the tools used by street sweepers. According to Richard T. Fox, "The length of time any refuse, other than dust, is permitted to remain on the street will determine the standard of cleanliness of that street." Mr. Fox's intensive method of cleaning requires that the patrolmen first make a clean-up of the

Unit Costs of Cleaning Different Kinds of Pavement.

Kind of pavement.	Yearly cost per 1,000 sq. yds.	Ratio of cost to cost of cleaning asphalt.
Medina stone block (almost exclusively in the business district)	$22.98	153
Brick (none in business districts)	15.54	104
Asphalt	14.96	100
Wood block (practically all in residential districts)	13.42	96
Averages	$16.72	112

Kinds and Sources of Street Dirt.

Kinds of Street Dirt	*Possible Means of Decreasing Amount of Street Dirt*	*Ordinary Methods Employed in Laying or Removing Street Dirt*
Blown dust	More frequent cleanings	Sprinkling, sweeping, flushing
Smoke and coal dust	Stricter enforcement of smoke ordinance	Sprinkling, sweeping, flushing
Horse droppings	None	Sweeping and scraping
Paper and refuse thrown by pedestrians	Police vigilance and public cooperation	Paper barrels, sweeping *(Sidewalk sweeping downtown)
Sand from car tracks and block pavements	None	Sweeping and flushing
Dirt dropped from vehicles	None	Sweeping and flushing
Hay from hay wagons	None	Sweeping and flushing
Leaves	Require them to be put in barrels or bags or burned	Sweeping and pick-up teams
Lawn rakings	Require them to be put in barrels or bags or burned	Pick-up teams
Mud from unpaved streets and allays	Pave such streets and alleys	Sweeping and pick-up teams.

*Sidewalk sweeping downtown by the Department of Public Works would aid greatly in keeping the streets clean and in overcoming the results of present haphazard methods employed by individuals.

night's deposits, and then make a number of trips over their routes picking up deposited refuse. It was found in Chicago that by so doing no refuse needed to remain on the street more than 15 minutes before it was removed. The men on this work traveled an average of six lineal miles a day, in comparison with 4½ miles traveled in following the older and more universal method in which sweeping is done almost the entire distance; they did more walking but less sweeping.

The 15-minute standard of cleanliness must of course be modified to suit the length of route of the patrolman, since the longer the route the less the number of trips that he can make over it. Many things must be considered in determining the area limits of patrol routes; no definite rule can be made for any one type of pavement, and the practicable area varies with the type. Following factors should be taken into account in laying out patrol routes for individual sweepers:

1. *The ability and agility of the sweeper.*—This is an important factor on busy streets and affects the quantity of work accomplished as well as the safety of the men.

2. *The quantity of dirt deposited.*—This can be determined only from daily reports of the number of tubs filled on each route. The amount of dirt a sweeper picks up in a day, while not a true index to the work done, is yet a valuable factor in comparing the work on different routes and the work of a given man on his own route from day to day.

3. *The amount and kind of traffic.*—Congested traffic causes many delays and much lost time. Sweepers on busy streets have to keep one eye on moving vehicles, and their work is hampered by those standing along the curbs. Horse-drawn traffic makes more dirt than automobiles and is in the way longer, but is less dangerous to the sweeper.

As a safety precaution, sweepers should be required to sweep against traffic, so that their backs will not be turned to approaching vehicles.

4. *The kind and condition of pavement.*—The smoother the surface, the easier and cheaper it is to clean. Other things being equal, the ease with which pavements can be cleaned is in the order—wood block, asphalt, brick, Medina block (dressed stone), Medina stone (undressed). (This refers to these pavements as laid in Rochester.)

5. *The amount of walking required.*—The more trips a man makes over his route, the shorter will be the time during which a deposit of dirt remains on the street.

6. *Straightness of route.*—From a control standpoint, straight routes are best, because the foremen can find the men more quickly. Also the fact that a sweeper can be seen somewhere on a street at all times makes people better satisfied and less liable to make complaints. This psychological effect produced by the visibility of the sweeper is borne out by local experience.

7. *The area.*—This must vary with the locality, the amount of dirt and traffic and the condition of the pavements.

8. *Number of men on a route.*—Sweepers work better alone than in pairs, because they have less temptation to stop and talk and because the progress of a pair is always at the rate of the slower one.

9. *The proximity to the sweeper's home.*—It has been found locally that some of the men do their best work and take most pride in keeping clean the streets near their own homes. However, there is a temptation in such cases to take long dinner hours and go in to rest frequently. Sweepers so situated doubtless would require close supervision, but negligence can soon be detected by the appearance of the route.

The limiting areas proposed for Rochester for each of the four classes into which the streets are divided by the authors of the report are as follows:

Limiting Areas for Sweepers' Patrol Routes (Square Yards).

Kind of Pavement	Present Practice	Proposed Practice	Streets
Asphalt	12,445	8,000 to 10,000	Business
Asphalt	25,372	10,000 to 20,000	Semi-business
Asphalt	12,110	8,000 to 15,000	Tenement
Asphalt	25,825	12,000 to 25,000	Residential
Brick	No brick	No brick	Business
Brick	19,184	6,000 to 15,000	Semi-business
Brick	13,092	7,000 to 13,000	Tenement
Brick	18,000	10,000 to 20,000	Residential
Medina	7,166	2,000 to 5,000	Business
Medina	14,000	3,000 to 6,000	Semi-business
Medina	11,676	3,000 to 6,000	Tenement
Medina	13,410	4,000 to 7,000	Residential
Mixed	14,963	3,000 to 6,000	Business
Mixed	16,920	5,000 to 10,000	Semi-business
Mixed	13,222	4,000 to 8,000	Tenement
Mixed	26,707	7,000 to 22,000	Residential

PATROL SWEEPERS' TOOLS.

The equipment of patrolmen in Rochester, which is considered satisfactory for the most part, weighs approximately 115 pounds. It consists of 1 push broom or pan scraper, 1 short handled house broom, 1 Davis scoop shovel, 1 removable wooden barrel on a push cart, or 1 box cart.

The brooms used are made in three sizes—18, 24 and 36 inches in width. The fibre brooms for general use are made of African bass. They consist of six rows of fibres seven inches long, set in a block usually eighteen

YARD RAKINGS IN GUTTER.
Placed there late Saturday afternoon, and remained uncollected until Monday.

CONTRACTORS USING ASPHALT PAVEMENT FOR MIXING BOARD FOR MORTAR.
Leaves unsightly stains and rough places.

inches long. When the fibres are worn down to four inches, brooms should be discarded. Eighteen-inch wire brooms are used for sweeping Medina block pavements. The 36-inch push brooms are useful in gathering wet leaves, but for general use they are too heavy for the average man to handle effectively. The 18-inch and 24-inch sizes have been found to give the best all-around results.

The handles of the push brooms are all about six feet long when new, but it is difficult to find handles even six feet long, because the men make a practice of cutting them down. The result is that they make harder work for themselves, because they have to bend their backs unnecessarily. Street sweeping should be done with alternate short and long, full, freearm strokes, which is impossible with short broom handles. Broom handles should be made in two lengths, six feet and six and one-half feet long, for tall and short men. The handles should be set at such an angle that all the broom fibres are in contact with the street surface when the sweeper uses the broom properly. The broom should be held firmly with both hands, one close to the end of the handle and the other about two feet from it, both hands with the knuckles outward. Sweepers should be able to sweep on either side.

As freezing weather makes sweeping difficult, brooms should be supplied with iron scrapers on the upper edge so the broom head may be turned over and used for scraping hard cakes of dirt, and for getting dirt out of crevices.

The pan scrapers are used on asphalt pavements in summer in place of a broom. In winter they have proved useful in scraping snow from all types of pavements. These scrapers consist of a flat sheet of steel, turned up at both sides and back, with a cutting edge in front. The pan is about three feet wide and one and one-quarter feet long, with a long, straight handle attached. It is believed that better results would be obtained if the handles of the scrapers were set at an angle with the pans. This would increase the carrying power of the pans, and would make possible proper gripping of the handles.

The scraper should be grasped in the same manner as the broom, and should be pushed along on one side of the body, never in front of it. In using pan scrapers on smooth pavements, care should be taken not to smear moist dirt over clean portions of the pavements. If moist deposits cannot be carried along in the scraper pan, they should be picked up immediately, and not pushed along in front of it. Dirt should be brushed or scraped up into piles in the gutter, about 18 inches from the curbs, and picked up by means of a short-handled house broom and a short-handled scoop shovel, and placed in a tub or barrel on a barrel carrier.

METHOD OF FASTENING COVER TO CAN.
Iron scraper on back of broom adds to its usefulness.

The barrels are wheeled about on wooden carriers which are made at the repair shop at a cost of $11 each. Last summer the Department owned 245 of them, and more have been manufactured since then. They weigh 70 pounds each, which is a little heavier than necessary, but they are well balanced and substantial.

The removable barrels or tubs have a capacity of 0.16 cubic yard and weigh 40 pounds each. Each sweeper uses from four to eight of these a day, depending on how often they are emptied by the pick-up teams. At the close of last season the Department owned 1,225 of them, which were used solely for the purpose of collecting street refuse. These tubs were purchased for $4.50 each, unpainted, and last a number of years.

In many localities the owners of vacant lots request that the street sweepings be used for filling in low places. The sweepers on streets adjacent to those lots are supplied with box push carts having a capacity of 0.72 cubic yard instead of tubs and tub carriers. The box carts have slides in the front end, which make it easy to dump the loads out on the ground. This manner of disposal is convenient and cheaper than when the material is removed by the pick-up teams. These carts have 4½ times the capacity of the tubs. Forty-nine of them were used last summer and fall for collecting street refuse and leaves.

DOUBLE CAN CARRIER.
Reduces amount of walking necessary. Used in New York City, but not in Rochester.

In sections of the city where there is a large amount of litter, patrol sweepers should have a burlap bag (similar to those proposed for use by litter patrolmen) in addition to their regular equipment. This bag should be carried over the route when collecting papers, cans, fruit skins and other large pieces of litter prior to sweeping. When not in use, the bag can be hung on the barrel carrier.

SWEEPING PROCEDURE.

The best sweeping can be done in dry weather, because a broom has little effect on wet mud. Care should be taken, however, to grasp and use the brooms properly so as not to raise a cloud of dust when sweeping. In wet weather much dirt is washed off the streets, so less sweep-

EXTRA CANS KEPT COVERED.
To prevent dirt and paper from blowing from them and flies from gathering and depositing eggs.

ing is required. However, sweepers should be prepared to stay out during rain storms, because they are needed then to keep the sewer inlets open and the gutters free from obstructions to drainage, to sweep mud and water from depressions in the pavements, and to make the crosswalks as free as possible from mud and pools of water. In wet weather the sweepers are laid off in Rochester, on the assumption that it is economy to do so and because (it is said) the men are glad to get holidays. The results of this practice are dirty streets, clogged inlets, muddy crosswalks and accumulated litter. It is evidently false economy.

The best modern street cleaning practice indicates that the first two hours in the morning can best be devoted to a general clean-up of the night's accumulation. The remainder of the day then should be spent in patrolling the routes and in picking up the dirt and refuse deposited during the day. After the first clean-up the sweeper should cover his route as many times as is conducive to good results.

When there is a considerable deposit of litter, this should be attended to first. Following the litter pick-up work, sweeping should be done starting at the center of the street and working toward the gutter, in the direction of the long joints of block pavements. The work should progress in the face of traffic so the sweeper can keep an eye on approaching vehicles. (The white uniform is a factor of safety to the sweeper, because drivers can see at a glance that the wearer's place is in the street.) After dirt is swept to the gutter, it should be brushed or swept into piles about 75 feet apart and not less than 18 inches from the curb. Not more than three piles should be left on the street at a time. The dirt should be picked up and placed in the barrels as soon as possible, to keep it from being scattered, thus saving unnecessary extra work.

Varying conditions of traffic and pavement have a marked effect upon the procedure which patrol sweepers should follow. On smooth pavements in residential districts, automobile traffic sends most of the dirt away from the center toward the gutters. On many such streets no sweeping is necessary in the center. Occasional deposits of dirt and horse droppings should not be swept to the gutter, but should be picked up in place with a shovel and house broom. The eight or nine feet of pavement nearest each curb require regular sweepings, which, on smooth pavements, should be done longitudinally and in the direction opposite to the movement of traffic. Thus the route may be covered by one trip each way, with occasional stops to pick up deposits and to pile dirt in the gutters. Streets of this kind should be flushed at least three times a week, to remove fine dust which cannot be removed by the sweeping.

On car track streets the problem is not so simple, even where other traffic is light. Track areas in Rochester are paved with Medina blocks, bricks or wood blocks, whether or not the remainder of the street is paved with asphalt. Track paving, especially at switches and crossovers, is apt to be rough and uneven and hence hard to clean. Dirt must be swept out of the rail grooves and switches, and the rough pavement requires extra cleaning. On the single-track streets, the entire track area should be swept in the direction of the long joints of the blocks and toward one side. On double-track streets the track areas should be swept from the center to each side. If possible, the dirt from the track areas should be picked up without first sweeping it to the gutters. If the dirt is heavy and cannot be picked up conveniently near where it lies, it should be swept and piled in the gutters as is necessary on heavy-traffic streets.

On business and semi-business streets, where traffic is heavy and car tracks are usually to be encountered, more sweeping is necessarily required than on outside streets. On such streets the sweeper should start at the center and sweep toward the gutter a distance of one stroke. After a window is made 20 or 25 feet long, the dirt should be carried another stroke's length toward the gutter. This should be repeated until the whole 20-foot section is swept to the gutter, when the process should be repeated on the next 20 feet of pavement. After the route is well swept up, the remainder of the day should be spent in patrolling, picking up paper and deposits as near the point of origin as possible and as soon as possible.

The most common faults noticed in the work methods employed by local street sweepers may be summed up in the following:

"DON'TS FOR SWEEPERS."

1. Don't let paper or litter of any kind remain on the street.
2. Don't sweep across a clean place. Shovel up the deposit where it lies.
3. Don't sweep into sewer inlets or depressions in the pavement.
4. Don't raise clouds of dust when sweeping.
5. Don't slide the broom along the street. Use short and long strokes strong enough to move the dirt the first time.
6. Don't sweep against a strong wind.
7. Don't work with traffic except when absolutely necessary. Work against it so you can see approaching vehicles and avoid accident.
8. Don't forget to report the following to the foremen: Dead animals, water leaks, clogged inlets, depressions in pavements, and violations of the ordinances affecting cleaning and collection work.
9. Don't deposit dirt anywhere but in the collection barrels.

The contents of the sweeper's barrels and dirt or leaves piled along the gutters are picked up by teams, Rochester using two horse-drawn five-yard———* dump wagons, each accompanied by two loaders with large, flat shovels in addition to the driver. The sweepers keep their full barrels in a definite place and the contents are collected at least once a day. Enough pick-up wagons should be used so that it will not be necessary to leave full barrels out over night, or piles of dirt or leaves left behind machine sweepers. If street refuse is not removed shortly after being brushed up and piled, it not only gives an otherwise clean street an unsightly appearance, but the refuse blows about and makes extra work later on.

It was recommended that the city experiment with the use of motor trucks for this pick-up work in residential district where the hauls are long, keeping careful account of unit costs in comparison with team costs on the same work in the same locality.

To be continued.

COST OF HIGHWAY MAINTENANCE IN WASHINGTON.

In the state of Washington a state-regulated, county-administered system of maintenance has been in operation on the primary highways since June, 1917. At the end of 1917 the State Highway Commissioner, James Allen, from his experience of that year, prepared for use in 1918 a form for annual estimates and monthly reports embodying a simple but complete system of itemized cost-keeping. By use of these, valuable records were assembled from which can be ascertained the exact main-

*Name censored. See editorial in this issue.

tenance and repair expenditures and apportionments of equipment cost upon each section of nearly 1,400 miles of highways.

The division of highway sections is by types of construction, so that there are reported separately the maintenance costs of brick, concrete, asphalt, asphaltic concrete, and bitulithic pavements, and of bituminous and water-bound macadam, crushed rock, gravel and natural earth surfaces. It is believed that five years of consecutive cost keeping is necessary for making any convincing comparisons of maintenance costs of different types. However, the figures for the first year have considerable interest.

The first year's expenditures (June, 1917, to May, 1918, inclusive) for maintenance, repairs and equipment for the primary highways totaled $430,188.63, and averaged $327.84 per mile. However, the returns for the first eight months of 1918 indicated that for that year the cost would average about $400 a mile. This is believed to be a maximum based upon the highest cost of labor and materials ever known, and $300 per mile is probably a safe estimate of the average cost.

Comparing costs by counties, the averages are found to vary from less than $100 up to $1,000 a mile. "Many local factors enter into these varying county rates of expenditure, especially those relating to comparative traffic wear, types of constructon, inclusion of incidental improvements with maintenance costs, excessive repairs required to overcome flood effects in certain counties, extensive purchase and apportionment of maintenance equipment and particularly the different plans of maintenance organization and supervision in the thirty counties. While these local factors justify substantial variances between county mileage cost averages, it is certain that the range of difference shown by the records is far too wide, and invites most serious attention by the responsible county authorities.

"In January, 1919, the completed record of 1918 maintenance expenditures will be available. A series of tabulated cost statistics covering the two annual periods (June-December, 1917, and January-December, 1918) arranged by counties, by highways, and by types of surfacing construction in convenient form for purposes of record and comparisons, will then be compiled and published as an appendix to this biennial report and particularly for February and March reference by the members and committees of the 1919 Legislature Session."

BASE CONSTRUCTION ON STEEP GRADE.

The illustration shows a method employed for placing the concrete in a pavement base on a steep grade. The concrete mixer was set at the top of the grade and a sectional wooden chute was laid from the mixer to the bottom of the grade. The grade was one of 26 per cent. and the concrete ran to the bottom of the chute by gravity with very little assistance. Concreting was begun at the bottom of the grade, and as the completed base advanced up the hill, section after section of the chute was removed.

PLACING CONCRETE BY MEANS OF CHUTE LAID DOWN HILL ON A 26% GRADE.

WATER WORKS OPERATION: RESERVOIR MAINTENANCE.

Collection of Sediment in Reservoirs and Methods of Removing It—Flushing Out, Pumping, Wheelbarrows and Wagons, and Dredges.

SEDIMENT.

In addition to the organic matter that is washed into the reservoir, there will almost always be more or less sediment brought into an impounding reservoir by tributary streams. This sediment may collect in enormous amounts so as to rapidly decrease the storage capacity. In addition, sediment may collect around the intake pipes or tower so as to interfere with the withdrawing of the water from the reservoir into the distribution system, or at least cause more or less contribution of sediment to the water so withdrawn. Streams draining a soil of gravel or coarse sand or a watershed that is adequately protected from erosion may carry so small an amount of sediment that it can be neglected for years at a time; while in other cases the streams may carry so much sediment that it will be necessary to dredge out the reservoir at intervals that it may retain its capacity. Kensico Lake, N. Y., collected silt to only about 3% of its depth in 23 years, while La Grange reservoir in California lost 50% of its capacity in 10 years. Beaver Dam creek, in North Carolina, brought down 12,000 cubic yards of sediment in one year from a catchment area of fourteen square miles that was denuded of trees.

Distributing reservoirs that receive water pumped from muddy rivers will of course collect sediment. For instance, a reservoir at Trenton, N. J., receiving water pumped from the Delaware river and which is about 700 feet long by 400 feet wide was found after twenty years to contain about 6,000 tons of mud and sand. Reservoirs receiving water pumped from some of the muddy rivers and streams in the south and in the Ohio and Mississippi valleys accumulate sediment much more rapidly than this.

The amount of sediment reaching an impounding reservoir in many cases can be reduced by the cultivation of trees or other vegetation on the catchment area. Another method sometimes employed is to build low dams along the streams which feed the reservoir, these dams serving as small sedimentation reservoirs to permit clarifying of the water. Or, if the topography permits, a low earthen dam may be built in the main reservoir a short distance from the mouth of the stream that feeds it, thus forming what is in effect a sedimentation basin at the upper end of the reservoir. If either of these methods of construction is employed, it is generally necessary to remove sediment from the small sedimentation basins at sufficient intervals to keep them effective; but silt can be removed from small sedimentation basins much more readily than from main reservoirs.

There are four general methods of removing sediment from reservoirs—flushing it out through a pipe or other outlet at the lowest part of the reservoir; pumping it out by use of a suction dredge or other method by which the sediment is mixed with abundance of water; dredging by means of buckets; removing by shoveling into wheelbarrows, carts, buckets swung from derricks, etc.

In the majority of cases removal by water is much the cheaper method, but this of course requires the presence somewhere in the vicinity of a stream or low spot into which the water carrying the sediment can be discharged. If the reservoir contains a blow-off gate or pipe, or if the distribution main leading from the reservoir is provided with a blow-off and the general conditions are such that it can be used for this purpose, washing the mud out by gravity through such outlet is the cheapest method of removal. Merely opening this outlet, however, will not secure the removal of sediment at any great distance from it, no matter how great the volume of water in the reservoir, since a velocity sufficient to pick up the sediment is not obtained by the water except at and for a short distance back from the outlet. It is therefore necessary to move the sediment from the various parts of the reservoir toward the outlet, and the use of more or less water is desirable for this also.

Where the reservoir is comparatively small, as in a distributing reservoir or a sedimentation tank, water can be used through hose, supplied from the pumping main by which the reservoir is filled or by a special portable pumping plant; the jet of water being played against the face of the sediment so as to wash it away as in hydraulic mining. As the face of the sediment recedes from the outlet, there is a tendency for the water that is carrying it out to deposit some of it, and to prevent this it is sometimes necessary to agitate the water to keep the sediment in suspension, or to push it toward the outlet by use of squeegees or wooden shovels similar to large snow shovels. In fact, where it is desirable to minimize the amount of water used, it may be preferable to use merely enough water on the sediment to soften it a little if it should be packed hard, and move it all to the outlet with large shovels operated by two to five men, using the stream of water to wash it through the outlet to the point of deposit. Another method of conserving water and preventing re-deposit of sediment is to provide a number of planks with cleats fastened to one side so that the planks can be stood on edge, using these planks to form the sides of channels in which is confined the water carrying the mud to the outlet.

Where the reservoir to be cleaned is a large impounding one, there will generally be sufficient water flowing in the impounding stream to serve for removing the sediment. Sometimes, if the amount available is not abundant, it is well to construct a temporary dam just above where the excavation is taking place, provided with a gate, so that the water can be dammed up for a short time and then released, thus furnishing a greater volume of flow than where the flow is continuous. In this case the original channel of the stream, which ordinarily will extend to the clean-out outlet, can be used for carrying the water and the sediment can be shoveled or drawn by scraper or otherwise into this channel. If the channel is filled with sediment it may be worth while to dig this out as a preliminary to the cleaning, or a channel can be formed by using the more solid matter in the sediment for forming banks for such channel. For bringing the sediment from points at some distance from the main channel, wooden flumes may be used, being extended by additional lengths as the excavation recedes from the main channel, the sediment being shoveled into the flume while water is played into it through hose from a portable pumping plant; the flumes being shifted from time to time to keep them near where the sediment is being shoveled up.

Ordinarily it is not necessary or desirable to remove the sediment below the level of the outlet of the reservoir, since when in service the reservoir will not yield any water below this level, and the deep water in such holes has practically no circulation and in time becomes foul with organic matter. If, however, the sediment in these low spots contains much putrefactive matter, this should be removed and it would be a good plan to fill the depressions with gravel or clean soil of any kind if this can be done at small expense, as perhaps by use of scrapers in leveling off near-by elevations.

In some cases reservoirs have not been provided with clean-out outlets, so that the method just described is not applicable. The sediment may then be removed by wheelbarrows or teams, a runaway being built at an incline up one side of the reservoir if the banks are steep. Or a drag-line scraper can be operated from the top of the bank. Or a portable centrifugal pump or other type suitable for pumping muddy water may be located in the bottom of the reservoir at the lowest point and the sediment washed or scraped to the suction of the pump and there diluted; the pump discharging the dirty water through a pipe over the bank of the reservoir and onto low land in the vicinity. In some cases the dirt has been removed by derrick, the buckets being filled in the reservoir by hand and emptied into carts on the top of the reservoir bank, by which the dirt is removed. This is practicable only for sediment that is coarse enough and solid enough to be shoveled. In fact, there may be near the inlet of any reservoir material so coarse that it is impracticable to remove it by water carriage, and some method of removal in bulk, as by cart, wheelbarrow or derrick, will be necessary.

CLEANING RESERVOIR AT TRENTON, N. J.
Sand being removed by derrick and bucket in the foreground. At the center, floating pump discharging mud through floating pipe line.

In any of these methods involving the use of water, where the reservoir is small and it is necessary to remove the sediment frequently (as in the case of sedimentation basins or reservoirs receiving very muddy water), it has been found worth while to build a water main, say six inches diameter, in the walls or banks of the reservoir and supply such main with hose connection at intervals of say fifty feet, so that lines of hose may be connected wherever wanted and water supplied under pressure at any part of the reservoir.

The methods described require the emptying of the reservoir and if there is not a duplicate reservoir, ar-

rangements must generally be made for continuing the supply during the cleaning by a by-pass around the reservoir or pumping directly into the mains. In some cases, however, there may be more than one distributing reservoir or the reservoir may be divided into two parts by a retaining wall, in which case of course one part is retained in service while the other is being cleaned. In the latter case water for flushing out the sediment may be obtained from the other half of the reservoir, either by means of a pipe or pipes passing through the division wall and provided with hose connection, or by means of a pipe carried over the division wall and acting as a syphon. In any case it must be remembered that volume of water for removing the sediment is as important as velocity of the jet for loosening it up.

In many cases it would not be permissible to draw off the water in order to remove the sediment, since, in the case of an impounding reservoir, it might require several seasons to fill it again. The sediment can be removed from such reservoirs by means of a suction dredge discharging the sediment through a flexible line of pipes carried on floats to the point of discharge; or a dredge using a clam-shell or other type of bucket, the dirt so dredged up being discharged into a scow. Washington, D. C., for instance, maintained such a dredge continuously in a reservoir which received a considerable amount of sediment, and used it for a total of several weeks each year. Dredging of course stirs up the sediment to a certain extent and muddies the water, but in the case of a large reservoir the effect on the supply is hardly noticeable. The effect of the suction dredge in muddying water is usually less than that of a bucket dredge.

Disposing of the sediment that is removed is sometimes even more difficult a problem than getting it out of the reservoir. Where it is flushed out by water, the water removing it is frequently discharged into the bed of the stream below the dam in the case of an impounding reservoir and is gradually deposited along the stream. Where this would be objectionable, advantage may be taken of some point below the reservoir where an inexpensive dam, only a few feet high, and possibly built of timber, will hold back the water in a basin which will permit a large part of the silt so removed to settle out. In such case, however, a flood which will send waste water over the spillway would probably carry considerable of this sediment on down stream. Where the topography permits, by building walls or bulkheads along the banks of the stream and discharging the sediment-bearing water behind such bulkheads, the sediment will settle behind these and gradually build up level areas of land that may be used for farming or at least will be above the reach of flood flow in the stream.

In some cases the sediment so removed may be used to advantage around the shore of the reservoir for filling in places that are so shallow that vegetation grows in them to the disadvantage of the water supply. By throwing up banks, using for this the heavier sediment, and discharging silt-bearing water behind these, such low spots may be built up or swamps may be filled in to the improvement of the reservoir. Sediment removed in carts may of course be used for the same purpose.

In the case of a small distributing reservoir or the sedimentation basin of a purification plant, the disposal of the sediment is frequently not so simple. Where there is no stream available in which to discharge the water, it may be necessary to remove all of the sediment by wheelbarrows, carts or derrick and place it in spoil banks or on land of little value in the vicinity. In the case of a sedimentation basin, this should be foreseen in the planning and provision made for the disposing of the sediment. Where the basin is located near a river from which the water supply is drawn, there generally is no objection to washing the sediment back into the river, since it originated there in the first place. Where, however, the basin is far removed from a stream, it may be best and most economical in the long run to construct a sewer of ample size and sufficient grade to conduct the sediment-carrying water to a satisfactory point of discharge. Failure to give sufficient attention to this point has, in a number of cases, resulted in a water purification plant becoming a nuisance to those on a lower level or further down stream, or has in a short time created a most serious problem for the operators of the plant.

The cost of removing sediment by flushing it out has varied in a number of cases from ½ cent to 5 cents per cubic yard. The cost of removing it by shoveling, according to figures from a number of plans, has run as high as 50 cents, although 30 cents would probably be more nearly the average. When dredges are used, the depreciation and upkeep on the dredge or cost of getting it to and from the reservoir would probably be the chief item, unless the amount of silt deposited required almost continous dredging; the cost per cubic yard, therefore, would depend very largely upon the amount removed.

HEATING BY ELECTRICITY.

Presentation of Principles of Heating Residences, Which Prove the Impracticability of Ever Employing This Agency in General Practice.

The coal shortage of the past year or two has given renewed interest to the possibility of heating houses by electricity, especially because of the fact that in many sections of the country electric current can be generated in large quantities by water power. A report on this subject by the Hydro-Electric Power Commission of Ontario is therefore timely.

The commission apparently proves that there is no probability that houses will ever be heated electrically, unless in southern climates where only a little heat is required. The difficulties are (1) The enormous amount of energy that would be required and which could be applied more efficiently to other purposes; (2) The high cost as compared with other methods of heating.

Assuming an 8-room house, using 9 tons of anthracite coal during the winter for heating, as representing average conditions; and coal yielding 12,500 B.t.u.; then this house uses on the average the equivalent of 17.5 h.p. But the coldest days would probably demand a rate of coal consumption 50 per cent above the average, or equivalent to 26 h.p. Assuming that 40 per cent of the heat generated is not effective in heating the house but goes up the chimney, then the useful house power would be 10.5 on the average, or 16 during the coldest weather.

Electricity may be considered as 100 per cent efficient in furnishing heat; hence, if a house is heated by electricity there would be required a maximum equivalent of 16 h.p., or an average of 10.5 h.p. This average would amount to 52,920 h.p. hrs. for the entire winter. Since a kilowatt equals 1.34 h.p., this equals 39,700 kw. h. At 3 cts. per kw. h., this would give the cost for heating for the winter $1,191. At the low rate of 1 cent, the cost would be $397. "Power" rates as charged for current from Niagara Falls, Ontario, the cheapest in Canada, would make the cost $140. But since the current would

be used almost exclusively in the winter, and the peak load for every service would come at exactly the same time—the coldest days—it is doubtful if so low a rate as this could be granted for heating.

Since, at a cost for anthracite coal of even $10 a ton, the furnishing of heat for the assumed house would cost only $90, it would seem to be improbable that many would be willing to pay the difference for electric heat. The commission calculates that with the low rate of 0.35 cent per kw. h. for electricity, the price of coal would have to rise to $15.50 a ton before it would cease to be the cheaper.

Another consideration is the amount of hydro-electric power available. Niagara Falls is the largest single source of water power in the country, and the total power developed there would not suffice to heat the homes of the City of Toronto alone. It is, of course, out of the question to think of using coal for generating electricity for heating if hydro-electric power is too expensive.

Still another consideration is that of conservation. Under the most favorable conditions, not more than 12 to 15 per cent of the total theoretical energy in fuel can be converted into mechanical power; while in heating, 50 to 60 per cent of such energy is utilized. In the case of hydro-electric power, however, 60 per cent or more of the theoretical energy can be utilized in the form of mechanical power. Conservation of both sources of energy therefore demands that hydro-electric power be used for mechanical purposes and coal for heating.

An exception is noted by the commission as follows:

"The use of electric heaters, however, as auxiliaries to other systems to warm up an otherwise cold room or during chilly periods in the spring and autumn when the furnace is hardly needed will prove in very many cases a great convenience; and, provided that the periods of use be short, e.g., for an hour or two in the morning or evening, it will be almost as economical to use electric energy in this manner as to light a fire in the furnace, and very much less trouble."

For general heating, however, the commission sees no possible chance for electricity taking the place of coal.

SNOW ROLLING IN LACONIA.

It is impracticable to remove snow from all the streets of a city, although it is necessary to remove it from street railway tracks, and most desirable to do so from the entire roadway where such tracks are located. But in northern cities and villages, where snow collects to a considerable depth during the winter, streets may be almost impassable if something is not done, and many of these compact the snow by rolling, this being especially advantageous because of the general use of sleighs in these sections.

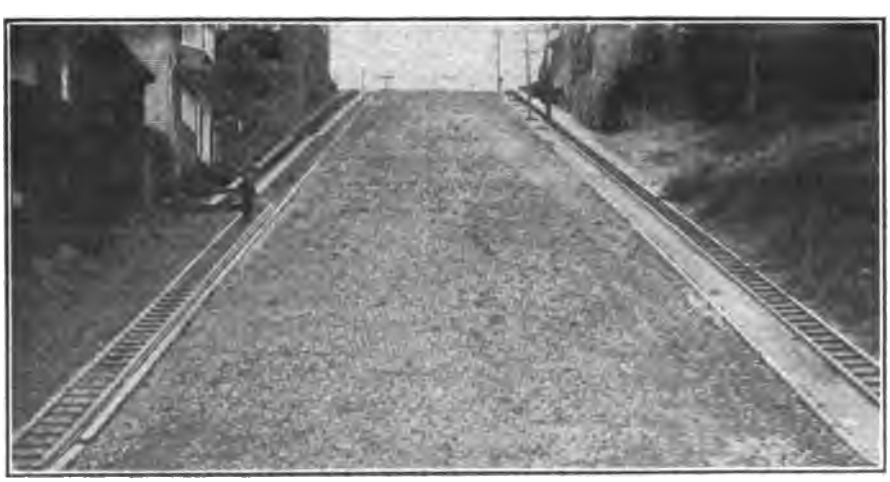
SNOW ROLLER USED BY LACONIA, N. H.

Laconia, N. H., has for several years used the kind of snow roller shown in the illustration, four having been in service last winter. This roller is 6 ft. 4 in. in diameter and each half is 5 ft. long. The weight is 4750 pounds. When the snowfall is not too deep the roller can be drawn by four horses, although six are often used. The sidewalks are cleared with wooden sidewalk plows and the piles along the curb are then spread onto the roadway with a road scraper mounted on runners, and then rolled with the snow roller. In cold weather, four-ton motor trucks can be driven over the rolled roads, but this is not practicable during a thaw if the snow is deep.

In breaking out country roads the roller is used if the fall exceeds 4 inches, or even for lighter falls if the road is drifted. One man drives the four or six horses and other men are sent ahead to shovel when drifts are encountered, and to level off humps and holes. The roller then passes over and compacts the surface so that it will hold a team. Six horses and three or four men will cover an average of 12 to 15 miles in a day of nine hours. The average cost is about $1.40 per mile, although this varies with the character of the snowstorm.

If the roads are rolled after each snow or wind storm, they will build up in cuts where drifts form, so that finally no more drifting occurs there. Also, on spots where the snow blows off and leaves the road bare, the rolling compacts the snow and maintains the road in good shape for sleighing. In many places excellent roads for sleighing are made over drifts 6 to 8 feet deep which otherwise could not be used without shovelling. In the spring, when the snow softens, some of the deeper drifts have to be cut out with the road machine.

The above information was furnished by Charles A. French, city engineer and street commissioner of Laconia.



STEPS UP SAN FRANCISCO SIDEWALKS.

On several of the steep streets in San Francisco wooden steps are built on the sidewalks, as shown in the photograph. In most cases where these steps are provided, the pedestrian can use either them or the smooth sidewalk, whichever he may prefer. Generally the steps are preferred to the sidewalk by a large majority.

The roadway in this illustration is paved with cobblestones. This type of pavement is being replaced with brick.

Municipal Journal

Published weekly at
243 West 39th Street, New York, N. Y.
by
Municipal Journal and Engineer, Inc.

S. W. HUME, *President*
J. T. MORRIS, *Treasurer* A. PRESCOTT FOLWELL, *Secretary*

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago

Contributed Articles and Reports

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

INCREASING MUNICIPAL REVENUES.

Most of the cities of the country that are not already "dry" derive an appreciable part of their income from liquor licenses. In some this revenue was not large, but in others it amounted to 15 per cent, 20 per cent and even 23 per cent of all the tax receipts. After this year this source of revenue will be cut off. In addition, the general trend of municipal expenses for years has been upward. There is, therefore, presented to most cities a serious problem that requires immediate attention—the increasing of the annual revenue for paying operating expenses. Certain municipal reports and results of investigations suggest the question whether new sources of income are needed, or whether an increase sufficient for some time to come cannot be obtained by a more thorough use of the present sources.

Investigations in certain small communities near New York recently revealed that in one municipality a piece of property containing thirty acres had been paying taxes on an assessment on eighteen acres; that property lying in two towns had been assessed in neither; that one large piece of property had not appeared on the assessment list for fifty years, and other similar omissions. Those who have made even superficial investigation of such matters will probably agree that there are few cities or towns where some such omissions cannot be found. There is only one way by which such conditions can be entirely remedied and this is by preparation and use by each municipality of an accurate assessment map on which every square foot of land within the taxable limits is represented, and accounting for every piece of land on the map each year as either paying taxes or as exempted from payment for legal reasons definitely stated.

The matter of exemptions is one that should be looked into carefully and given full publicity. We believe that if it were definitely stated to the tax-payers that, by removing the exemptions in their city, their individual taxes could be decreased by 10, 15 or even 25 per cent, there would be immediate demand on their part for a considerable reduction in the amount of property exempted.

The matter of uncollected taxes is one that demands drastic action. We venture to assert that there are many cities in which there is no record that is at all reliable of the amount of taxes remaining unpaid from previous years, and in a great many there are no means of obtaining legal evidence for the collecting of back taxes; while there are few cities that have exhausted their resources provided by law for collecting back taxes. We believe that if all taxes that are assessed should be collected except those that have been remitted for cause, an appreciable addition would be made to the income of most cities.

It is always easier to pass new laws than it is to enforce old ones, and there is a general tendency at the present time to rush to the legislature with bills granting cities additional means for providing revenue. Probably in some cases new sources of revenue must be devised before long, but in the meantime it would be much safer to enforce laws which have been tried out than to make experiments, the results of which remain to be proved.

TECHNICAL ARTICLES CENSORED.

A censor has been established over United States periodicals, and in accordance with his instructions we shall in the future omit certain items of information that it has been our practice to give in connection with our descriptive articles. We make this explanation to forestall inquiries by our readers as to why such omissions are made.

The Post Office Department, by the new postage rate law, is required to classify all the matter that appears in periodicals as either advertising or not advertising. In making this classification, it has decided that the naming of the manufacturer of or dealer in an article is advertising. Thus, if in an article describing concrete paving we should state that the cement used was furnished by the Beta Cement Company, or that the expansion joint material was made by the Tarrett Company (we can not use real names or this editorial would probably be classed as advertising matter), that makes the description advertising matter. Or if we reproduce a photograph of the mixer and state in the caption under the cut that it is a Keyring Machine Company mixer, that is advertising.

Engineers and contractors quite naturally desire to know what kinds of materials and equipment are used on difficult pieces of work, and we will be glad to furnish this information by letter to any who will write asking for it. Unless the ruling is modified or the law repealed, however, we will have to omit them from our non-advertising pages in the future, as otherwise we would have to pay for them the higher postal rates charged for advertising matter.

TO THOSE DESIRING ENGINEERING SERVICES.

A number of engineers who have been serving in the army or in government capacities during the war are about to be released from their present duties. It is the desire of the several national engineering societies to place these engineers in touch with contemplated projects as early as practicable.

State and municipal authorities, corporations and individuals who now have, or expect in the near future to have, need for the services of professional engineers are requested to immediately communicate their wants to the Engineering Societies' Employment Bureau, 33 West 39th street, New York City. This bureau is maintained by the four national societies of civil, mining, mechanical and electrical engineers.

The engineers that are now or soon will be open for engagements include many of the highest grade, and probably no better opportunity has ever occurred for securing just the kind of men wanted by cities, states or private companies.

The WEEK'S NEWS

Propose $50,000,000 Road Bonds for Michigan—Masking vs. Influenza in San Francisco—Financing City Hydro-Electric Plants in Los Angeles—Gas Company Fights New York 80-Cent Law—Fires in Dodge City, Ia.; New York, N. Y.; Pittsburgh, Pa., and West Warwick, R. I.—Permissive Legislation for Commission and Manager Government in Indiana—War Increased City Costs in New York State—Philadelphia's Mayor Not Guilty in Fatal Election Fight.

ROADS AND PAVEMENTS

$50,000,000 Bond Issue Proposed for Michigan.

Lansing, Mich.—Without a dissenting vote the state senate has passed a resolution introduced by senator William M. Connelly, Ottawa, for submission to the voters of a constitutional amendment giving the state authority to issue bonds up to $50,000,000 for the construction of paved roads in Michigan. It is the plan to have this proposed constitutional amendment submitted to the voters at the spring election if the joint resolution passed in the senate is acted on favorably in the house. Proper legislation to provide for carrying out the road paving program if the amendment is indorsed by the people is already under consideration. Senator Connelly states that it is no part of the plan to have the state take over any road except the trunk line system, which at present includes about 4,800 miles. He points out that the federal government is already inaugurating a national commission to carry out the government's work, the state will supplement this by the plan suggested for control of trunk roads, and the remaining tributaries will be left in the hands of the counties and townships, making one co-ordinated and efficient system for road construction.

To Build New Bridge.

Milwaukee, Wis.—After many years of effort, marked by bitter litigation, the new State street bridge, to replace the present span, will be constructed this year. Efforts of the city to procure a small strip of property have been hard fought, the case having been carried to the supreme court. This difficulty, however, has been amicably adjusted and a condemnation jury has acted favorably upon the acquirement by the city of the needed property. The new State street bridge will cost $250,000, exclusive of any sum involved in the real estate to be purchased. It will consist of two movable leaves, 116 feet between trunnions, and will have concrete and steel approaches at each end, providing a ninety-foot clear channel for navigation. The structure will carry a forty-foot roadway and two walks ten feet in width. The present structure, condemned, is a latticed swing bridge. It was erected in 1871. It has only a sixteen-foot roadway and walks less than six feet in width. Plans for the new bridge are now being completed by superintendent David McKeith of the department of bridges and buildings.

Suggests State as Contract Surety.

Albany, N. Y.—Discontinuance of the practice of having contracts for the department of highways guaranteed by security companies, and development of a plan whereby the state could insure its own contracts, are suggested by highway commissioner Edwin Duffey in his annual report. The commissioner told of a practice which had grown up, under which contractors without prior experience and sometimes without financial resources were provided by a surety company with a certified check necessary to bid. If such a contractor proved to be the low bidder he received the contract and the surety company wrote his bond. Several contractors, most of whom had obtained contracts with the aid of the surety companies, abandoned their work when war conditions raised the price of labor and materials. Others continued the work, but in an unsatisfactory manner. In some cases surety companies obtained injunctions restraining the department from compelling the completion of contracts on the ground of impossibility of procuring labor and materials. "It would seem," the report says, "that a plan could be evolved by which the state could insure its own contracts and thus receive the protection for which payment is made." The report states that in 1915, the last year when normal conditions prevailed, contracts were awarded for the improvement of 1,073 miles of highway at a cost of $11,790,000. At the present price of labor and materials little more than half that mileage could be completed for the same money.

SEWERAGE AND SANITATION

Influenza Decrease Follows Compulsory Masking.

San Francisco, Cal.—After five days of compulsory masking throughout the city, for the second time, health officer William C. Hassler announced that the situation was once more under control. He said: "The danger remains, however, of a sudden flare-up through contact with visitors from areas where the disease is not under control, and for this reason I deem it advisable that the masks continue to be worn, even though the local epidemic appears to be eradicated." For the five days before and five days after the masking order went into effect, the official record of new cases and deaths was as follows:

	New cases.	Deaths.
January 15	510	50
January 16	538	42
January 17	519	39
January 18	412	25
January 19	400	16
*January 20	366	40
*January 21	183	22
*January 22	164	15
*January 23	118	11
*January 24	85	20

*Masks on.

On the first day of required masking, 186 persons were arrested for violation. Masks must conform in construction and method of wearing with the regulations. The state board of health has argued that the value of masking has not been proved. Dr. W. H. Kellogg, secretary of the state board, based this view on mortality charts showing that the peak of the epidemic and the fall in most cities had been the same whether the mask was worn or not, and regardless of the closing of schools, theatres, etc. He insisted that any chart based on the number of cases was not reliable, because all the cases never were reported, while deaths had to be. He said everybody was at a loss to tell where the influenza came from or how it could be controlled, and hence the state board did not feel justified in recommending the enforced use of the mask. He attributed the apparent drop in cases after the mask was put on to the deceit of the doctors. He said the latter unconsciously were anxious to see the mask enforced, so reported many cases as bad colds and not influenza as they had been doing. It was a psychological effect, he said. When the masks would be renewed, the doctors would start faithful reporting again. "The progress of the influenza," said Kellogg, "has been shown by comparisons to be uniform, self-influencing and self-limited.

The length of time has been the same in all cities, despite various preventive measures used. I don't say the mask is no good, but there is no proof of individual benefit accruing from its use. I will admit the theoretical benefit and would wear a mask myself in treating cases, but there is nothing to show its forceful use has done any good. If found good, the state board will be the first to get behind it." Health officer Hassler said that while the mask may not be 100 per cent. perfect it was worth using if it were only 50 per cent. perfect and helped reduce the epidemic. He traced the epidemic in San Francisco, how it reached its peak on October 23 and fell off immediately upon the enforcement of the mask. It flared up again after the New Year's celebration, after the mask had been taken off, and is being reduced now by the return of the mask. "The rise and fall of the influenza in October in San Francisco and other cities may have been a coincidence, as Dr. Kellogg suggests," said Hassler, "but there is no coincidence about the present situation in San Francisco. The mask has a definite value in that it is a preventive in assemblies of people and where influenza carriers are mingling with crowds." The attitude of the state board is encouraging the Anti-Mask League, which seeks repeal of the masking ordinance by "lawful means."

More attention is being paid to reporting of cases by physicians. In Los Angeles, a doctor was arrested and fined $10 for failure to report a case of pneumonia. Health commissioner L. M. Powers has warned that the full $50 fine will be administered hereafter.

"Health Sunday" Postponed.

Washington, D. C.—Because the committee having charge of the Theodore Roosevelt memorial services has designated Sunday, Feb. 9, as the day on which this memorial should be nationally observed, it has been necessary for Surgeon General Rupert Blue of the United States Public Health Service to ask that the date for "Health Sunday" be changed to the last Sunday in February—the 23d. Sunday, Feb. 16, is to be devoted by the leading churches of the country to raising a fund of several millions of dollars for social reconstruction work. Already many of the leading pastors of the country had signified to the surgeon general of the United States Public Health Service their intention of holding specially arranged services in support of the nation-wide campaign now being carried on by the division of venereal diseases under Assistant Surgeon General C. C. Pierce for the suppression of prostitution and the prevention of venereal disease. These plans will all be transferred over to Sunday, Feb. 23. Surgeon General Blue has asked all the ministers of the country to "urge upon their people the timeliness of a campaign for civic cleanliness, both physical and moral, in view of the expected return of the men and women who went out to make sacrifices in the great crusade for righteousness and freedom."

Venereal Disease Campaign Includes Treatment.

Billings, Mont.—A report has been sent to Surgeon General Blue of the U. S. Public Health Service at Washington, describing the work of the venereal disease clinic being carried on under the direction of Dr. Louis W. Allard. The isolation and treatment of prostitutes in Billings was instituted September 20, 1918. As soon as the free clinic was opened the police department brought to the health office all of the known prostitutes then in the city; 32 women were thus brought in and examined; a few of these girls were found to be employed in legitimate business and they were allowed to continue this provided they complied with certain rules laid down by the health department, the principal one of which was that they were to report at stated intervals for treatment. Their addresses were all recorded, and in most cases their home conditions inspected. In connection with the clinic a homelike, well-furnished detention home has been established, sufficient to accommodate fifteen cases at a time. This is under the direction of a trained nurse, and many of the girls placed in this detention home are permitted to do day labor, reporting at night, when they receive treatment and occupy their rooms at the sanitarium.

STREET LIGHTING AND POWER

Financing Second Plant with Profits from First.

Los Angeles, Cal.—The city council has approved the recommendation of the public service commission that the city's surplus revenue, in the present fiscal year, from the sale of electric power shall be applied, "so far as practicable, to the construction of power plant No. 2, and works incident and appurtenant thereto." In the past fiscal year the surplus revenue was applied to the payment of the principal and interest of electric power bonds, thus reducing the city tax rate 8½ cents. It will take the surplus revenue of two or three years to finish power plant No. 2. The city has already expended over $1,250,000 of bond funds and other money for preliminary construction and special tunnels required in connection with this plant. The water of the aqueduct, on its way to this city, after passing through power plant No. 1, passes by the site of proposed power plant No. 2 where continually, day and night, it makes at present a useless drop of 530 feet. For the past year, the Municipal League has consistently urged the city government to take the action that it has now taken.

Power Plant Census.

Washington, D. C.—Preliminary figures of the forthcoming quinquennial report on the central electric light and power stations of Delaware, District of Columbia, and Maryland have been given out by Director Sam. L. Rogers, of the Bureau of the Census, Department of Commerce. They were prepared under the supervision of Eugene F. Hartley, chief statistician for manufactures. The statistics relate to the years ending Dec. 31, 1917, 1912 and 1907, and cover both commercial and municipal plants. They do not, however, cover electric plants operated by factories, hotels, etc., which generate current for their own consumption; those operated by the federal government and state institutions, and those that were idle or in course of construction. The number of establishments reporting increased from 56 in 1912 to 63 in 1917, a gain of seven, four of which were commercial and three municipal. During the same five-year period the income increased $3,803,905, or 70.6 per cent., as compared with an increase of $2,040,675, or 61 per cent. from 1907 to 1912. Steam power in 1917 formed 97.9 per cent. of the total for all classes of power, and a noticeable feature of these statistics is the steady increase in the capacity of the steam engines and turbines used. The average horse power per unit increased from 565 in 1907 to 997 in 1912, and to 2,702 in 1917. The increase in the output of stations from 1912 to 1917, amounting to 208,404,896 kilowatt hours, is significant of the growth in the business of the electric stations.

Wants Legislative Gas Price Declared Unconstitutional.

New York, N. Y.—The Consolidated Gas Company, in a suit begun in the Federal District Court, asks that the 80-cent gas law enacted by the Legislature several years ago be declared invalid because it is unconstitutional, on the ground that it is confiscatory of the company's property. The company says that for the year ended Oct. 31 last its net income was only $99,241.65, or less than ¼ per cent on its investment of $69,697,700, exclusive of good will and other intangibles. A temporary injunction is asked to restrain the attorney general of the state, the district attorney, and the public service commission, the three defendants, from taking any measure to enforce the 80-cent law. In its complaint the company offers a mass of figures to show lack of income to pay charges. Its gross operating revenues for the year ended in October, it says, was $15,764,288.11, while the cost of manufacturing and distributing the gas, including taxes and other expenses, was $15,665,046.46. Its net income of $99,241.65 represents a 6 per cent return upon only $1,654,027. Reference is made in the complaint to the decision of the United States Supreme

Court in 1909, when the first suit was dismissed, which was, in brief, that although a return of less than 6 per cent upon the value of the property employed would be confiscatory, and that while the lower courts found that the return at that time was less than 6 per cent, the margin "between possible confiscation and valid regulation" was so close that it failed to show clearly that a charge of 85 cents for gas would not yield a fair and reasonable return. The company says that at no time since this decision was rendered has it earned as much as 6 per cent. Since the statutory rate has been in effect, the company says, there has been a steady deficiency which now aggregates at least $12,000,000, which should be added to the value of the property and upon which a return should be allowed. Then the complaint says: "Since Dec. 31, 1906, there has been $14,085,265 added to the value of the company's property devoted to its gas business which was valued by the United States Circuit Court in the former suit at $55,612,435. The cost of reproducing the property at the present time would greatly exceed $69,697,700. A return of only 6 per cent upon the investment would amount to not less than $4,181,862 per annum. The net earnings of $99,241.65 for the year ended Oct. 3, 1918, amounted to only 55-100 of 1 cent a thousand cubic feet of gas sold." It is claimed that the deficiency is caused directly and solely by the "arbitrarily restricted price" at which the company is compelled to sell its gas. The company's average daily sales are stated to amount to 62,728,800 cubic feet, which makes the daily loss $14,264.53, which is rapidly swelling the deficiency in the company's earnings. The complaint sets forth the various items needed in its business which have grown so greatly in cost as well as the large increases in wages, and the greatly depreciated value of money, which makes the purchasing power of a dollar not more than about 60 cents. In a suit by the Brooklyn Borough Gas Co. last year for permission to raise rates Charles E. Hughes, who was governor of the state when the law was passed, was named as the referee with all powers of a court. He held that the eighty-cent rate was confiscatory, but made no recommendation.

FIRE AND POLICE

Fire Destroys Almost Whole Town.

Dodge City, Ia.—A spectacular fire, which started in early morning, swept through and almost destroyed the town, causing a loss of $100,000, which is only partially covered by insurance. The fire started in the rear of a pool hall. The flames then spread rapidly in spite of the efforts of fire crews from Camp Dodge, who played steady streams of water upon the fire for nearly six hours. The buildings were constructed of wood and plasterboard and burned rapidly. The ruins were still burning late in the day, and twice during the day the fire departments were called again because the blaze threatened what was left of the little city constructed on the hill east of the camp where the cantonment was first built. Practically all that remained of the town was the hotel and two small buildings. No one was injured during the fire. A $50,000 theatre was among the buildings burned.

Hundreds Fight Big Fire at Aviation Station.

New York, N. Y.—A fire, which started from the explosion of a gasoline torch in the hands of a workman, destroyed two buildings and threatened for a time to wipe out the Naval Aviation Station at Rockaway Point. The property loss was heavy, some persons asserting that it might reach $1,000,000. Two buildings valued at $60,000 each were destroyed, twenty-five Liberty motors were wrecked beyond repair, and eight modern equipped hydro-airplanes and quantities of oil and other supplies were burned. The fire was fought by 1,500 men from the aviation station and from Fort Tilden. The fire started at 10.30 o'clock in the morning when the gasoline torch, used in making some repairs in the Construction Building, exploded. The burst of flame caught in some linen used for wing covering, and in a few minutes the building, 100 by 100 feet, was spouting flame. In the building were nine hydro-airplanes. By quick work, men succeeded in wheeling out one before the fire reached it and this was the only thing in the building that was saved. The alarm of fire brought Ensign Ahearn and a great force of men. Their work was confined to saving property and preventing the spread of the fire by the use of water, sand, and ashes. They worked under great difficulty and in constant danger, for the wind sent the flames trailing at a great distance. Alarms brought the fire department apparatus from the Rockaways to the aviation field. There was insufficient water, and until a steamboat arrived the firemen had little hope of saving the camp. The engines of the boat pumped water, and in less than an hour after the boat arrived the flames were well under control. About 400 sailors formed a brigade and passed buckets from Jamaica Bay to a 5,000-gallon tank of gasoline which was near the danger area. Sailors poured water from the buckets on the sand, and a shovel squad in turn piled the wet sand on the tank. It was saved from destruction. One hundred feet from the construction building was a hangar in which were several airplanes. Stored between the buildings were about two hundred barrels of gasoline, which a large force of men started to roll into Jamaica Bay. While they were at this task, the flames leaped the intervening space and caught the hangar. Under this canopy of fire and in a shower of sparks the men continued to work. They succeeded in rolling nearly all the barrels of gasoline into the water before the intense heat drove them away. The energy of the volunteer fighters and a shift in the wind saved the other buildings. The volunteer fighters saved some fifty machines in all.

Fire Sweeps Crowded Tenements.

Pittsburgh, Pa.—Damage estimated at $90,000 and the destruction of the most thickly populated tenement square in the city, resulted from a fire which originated in a paper box factory and destroyed neighboring machine works. Thousands of Italians, Greeks and Syrians were driven in scurrying droves from their tenement homes. At 9.45 a triple alarm sent all the downtown fire companies into action on the pocket of closely packed four-story brick structures bounded by Epiphany street, Bedford avenue and Bigelow boulevard. A call by fire chief Bennett caused all the northside and southside companies to move in, and before 10 o'clock water was being poured into the furnace by a large number of engines than have attended a fire within recent years. The spectacular scene was set on a hillside and looked like a fiery drama on a mammoth stage and the audience was the thousands in the valley and on adjacent hills. The wind at 30 miles an hour fanned the embers, and every part of the blaze brought under control had to be watched. These frequently caught the flame again and occupied the attention of several companies. No lives were lost.

Many Towns Respond to Big Mill Fire.

West Warwick, R. I.—The Royal Mill in Riverpoint, West Warwick, one of the largest cotton textile plants in the Pawtuxet Valley, has been destroyed by fire with a loss of approximately $1,250,000. The fire started about 9 o'clock in the evening in the upper part of the 276-foot memorial tower, which rose from the front of the mill near its centre. When first observed, it was a slight blaze, and men with buckets of water undertook to extinguish it. It was at first thought that they had succeeded in doing so, but the flames broke forth again, and at a height which could not be reached with any water power available. The combined efforts of fire companies called from Phenix, Warwick and Coventry, Cranston, and one motor company from Providence failed to check the flames. The firemen kept the mill buildings drenched, and it was first thought that the fire might exhaust itself within the tower by consuming the relatively small proportion of woodwork in it. The upper third of the tower, however, was principally of timber construction, and this toppled

over upon the roof of the big main building and crashed through the two upper floors of the six-story structure. The flaming mass of timbers spread blazing embers in all directions through the two floors, and then the fire ran throughout the immense plant in such volume that there was no possibility of the fire fighting forces combating it within any measure of success. Before midnight it was apparent that nothing could be done to save the establishment, with its 48,000 spindles and 1,200 looms from utter destruction. In another hour the flames had reached every part of the six floors from roof to basement and the side walls were falling in. For a time it looked as if the entire village of Riverpoint might be wiped out, as masses of burning cotton rose from the mill and were blown on to the roofs of the Riverpoint store and other buildings near by. In several instances the firemen were called to put out small blazes in various sections of the village, often at distances exceeding 500 feet away from the burning mill. An explosion of boilers in the engine room, shortly after midnight, drove the flames toward the four-story ell at the westerly end of the big structure. This contained a large quantity of paints and a roller shop. The ell is adjacent to a large number of wooden mill tenements, the nearest one being only a few feet away. The street is narrow at that point and on the opposite side are scores of other dwellings. The firemen feared that if the flames spread into the ell, and at first it seemed like a superhuman task to prevent this, many of these wooden houses would ignite and result in wiping out that end of the village. The firemen, however, were successful in stopping the fire at that point.

GOVERNMENT AND FINANCE

Commission and Manager Forms in New Bill.

Indianapolis, Ind.—A bill to give cities in Indiana the right to adopt commission or city manager form of government has been introduced by Capt. James E. Southard, representative from Laporte county. As this is a Republican platform measure and recommended by governor Goodrich in his legislative message, it doubtless will be enacted. Where the city manager plan is adopted the five commissioners draw nominal salaries and employ a city manager, who shall have charge of all the city's activities. As the bill is drawn it provides that the city manager need not have been a resident of the city or state. An effort also is made to have him chosen for fitness. On May 1, of any year, upon petition signed by 15 per cent of the qualified voters of a municipality, a special election would be called by the mayor of the city for determining whether the voters desire to change from the present to the commission or city manager form of government. Within five days after receiving the petition, the mayor would be required to order the election to be held on a date set between thirty and sixty days thereafter, according to the bill, which is similar in context to the one that failed of passage at the last session. The expense of the election would be paid out of the municipal funds. If the majority of the voters were opposed to a change another election could not be held within the next two years. If the change was authorized five commissioners would be elected. Two would serve for two years and three for four years. Thereafter they would be elected to four-year terms, the elections being held biennially. These commissioners would elect a mayor, who would head the department of safety, preside at the commission meetings and who would have a vote on all questions before the commission, but would not be authorized to veto any ordinance. Municipal laws could be enacted only at legislative sessions of the commission. The right of referendum would be given the voters for approval or rejection of all ordinances enacted by the commission. The salaries of commissioners elected in first class cities would be $5,000 annually; in second class cities, $3,000 annually; in third class cities, $2,000 annually; in fourth class cities, $1,500 annually, and in fifth class cities, $1,000 annually. The mayor would receive 2 per cent additional to his salary as a commissioner. Bonds would be required of the commissioners for faithful and honest performance of duty. The work of the administration would be divided into departments of safety, finance, utilities, parks and public works. The fundamental laws for conducting these departments are provided in the measure, which also sets forth that many existing laws would continue in force, as they relate to the administration of public work. There would be three classifications of employes, the competitive, non-competitive and labor classes. Rules for the employment of persons in the classified service would be promulgated by the civil service created by the bill, for the purpose of assuring employment of persons who merit places by virtue of their efficiency, character and industry. They would be on probation the first six months of their employment. No employee could be discharged for his or her political or religious views, and none of them could take part in politics lawfully, while employed in the public service. The unclassified service would include the commissioners, city manager, if one is employed, city clerk, city attorney, and certain deputies and secretaries whom the commissioners could appoint. Employment of a purchasing agent also would be authorized. The measure provides that in cities where city managers are employed his responsibilities would include the seeing that all laws are enforced, appointing or removing all directors and employes, directing and controlling the work of the commissioners.

War Increased Municipal Costs.

Albany, N. Y.—A big increase in expenses and a decrease in the revenues of the cities of the state are shown in a recent report by the State Bureau of Municipal Information. The report says that mandatory legislation and the war have been responsible for an increase of over $4,300,000 in the cost of municipal government in this state this year, exclusive of New York City. Revenues have decreased because of the loss of the excise tax and tax exemptions granted by the state. The report gives eight main causes for the increase in the cost of city government. They are: Increase in population, increased or expanding functions, general rising cost of municipal government, increase in the number of voters, operation of the Fenner law, workmen's compensation insurance, high cost of living, and increased interest rate. The cities, with the exception of New York, last year spent $53,249.39 for compensation insurance. The Fenner law, which requires municipalities to pay to a city official or employe in the military or naval service the difference between his federal and municipal pay has cost the cities, with the exception of New York, $688,886.21 this year. Because of the increase in the number of voters all cities, with New York City excepted, have had to appropriate $303,230.21 more for elections this year than they did in 1917.

Philadelphia's Mayor Acquitted.

Philadelphia, Pa.—Mayor Thomas B. Smith, the last of the principal figures to be brought to trial in the Fifth Ward political row which resulted in the killing of a policeman at the primary election in September, 1917, has been acquitted by a jury of the charges of misdemeanor in office and conspiracy to violate an election law which prohibits city office-holders from taking an active part in politics. The mayor was on trial nine days, and the jury was out less than two hours in considering its verdict. Surrounded by friends and members of his cabinet, the mayor shook hands with the jurors and wanted to address them, but the court said it was not necessary. The Fifth Ward row resulted over the election of a city councilman which office carried with it the ward's leadership. Mayor Smith was alleged to favor Isaac Deutsch, and was accused of using police to swing the election and of failing to protect voters by taking no action to prevent the bringing of New York gunmen into the war. The New York gunman who slew the policeman is serving fifteen years in the penitentiary, and several others brought from New York received shorter terms. Deutsch and a number of policemen are under sentence of from one to two years on charges of preventing a fair election. They are out on bail pending an appeal to the higher court.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading ones published in other countries, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on muncipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

ROADS AND STREETS.

Planning:

Width of Provincial Highways. The Department of Public Highways has been authorized to assume, construct and maintain a system of "provincial highways" in Ontario; roads must be widened to meet modern requirements. 5 illus., 1,700 words. Canadian Engineer, January 9, 15 cts.

Necessity for the Proper Location of Roads. Things to note in locating a road. By A. Dennis Williams, chairman W. Va. States Roads Commission. 800 words. Canadian Engineer, January 2. 15 cts.

Regrading Hillside Streets. Readjustment of grades on steep hills in San Francisco opens up inaccessible building sites and increases property values. By Chas. W. Geiger. 2 ills., 700 words. Good Roads, January 25. 10 cts.

Cost:

Cost of Road Work in New England in 1918 50 to 100 per cent. higher than in the previous year. From a paper by Col. William D. Sohier, read at the meeting of the Association of State Highway Officials. 800 words. Engineer and Contracting, January 1. 15 cts.

Road Material Prices for the 1919 Season. Survey of the field indicates little change in existing level with slight decreases possible in some lines. 600 words. Good Roads, January 4. 10 cts.

Construction:

Rapid Road Construction Under War Conditions. Two interesting cases were described by Mr. Clinton Cowen, state highway commissioner of Ohio, in a paper presented at the Chicago meeting of the American Association of State Highway Officials. 500 words. Engineering and Contracting, January 1. 15 cts.

Labor for Soldiers on State Highways. Figures collected by the bureau of public roads of the U. S. Department of Agriculture, indicating the probable number of returned soldiers and sailors that can be used during 1919 in road construction and repair work. 300 words. Municipal Journal, January 25. 10 cts.

Day Labor, Force Account Work and Bonuses on Highway Construction. Contract system more economical than day labor; conditions unfavorable to day labor; advantages of bonus system. 2,500 words. Municipal and County Engineering, January. 25 cts.

Convict Labor in Road Construction in West Virginia. Data on the maintenance of the prison camp near Charleston, in 1917, given by A. D. Williams, chief engineer of the W. Va. State Road Commission, in a paper presented before the American Association of State Highway Officials. 600 words. Engineering and Contracting, January 1. 15 cts.

Machinery:

Utilizing More Mechanical Devices on Road Construction. Necessity of saving in the cost of labor; use of labor-saving mechanical devices in Michigan. By Frank F. Rogers, state highway commissioner, Lansing, Mich. 2,800 words. Municipal and County Engineering, January. 25 cts.

Steam Shovel Practice. Methods now used are the development of a quarter century; economy of operation dependent upon various practical elements; mechanical ability, good judgment and experience are essential to the effcient operator. By Capt. Llewellyn N. Edwards, supervising engineer of bridges, Toronto. 6 ills., 3,600 words. Canadian Engineer, January 9. 15 cts.

Road Contractor Successfully Employs Charging Bins to Eliminate Dumping and Wheeling on Subgrade in Concrete Road Construction. Advantages of bin method over dumping on subgrade. By Geo. A. Burley, R. D. Baker Co., Detroit, Mich. 2 ills., 1,800 words Municipal and County Engineering, January. 25 cts.

Operating Cost of Tractor, Trucks and Sand Screen and Loader in Road Maintenance. Interesting information on the operation of this equipment is given in a bulletin of the Colorado Highway Department by James E. Maloney, chief engineer of the department, in the maintaining of county roads near Denver. 600 words. Engineering and Contracting, January 1. 15 cts.

American Methods and Machinery Applicable to Construction and Maintenance of French Highways. An article the object of which is to assist engineers in France in restoring the roads that have been worn out by war traffic or destroyed by the enemy. 16 ills., 6,000 words. By Arthur H. Blanchard, M. Am. Soc. C. E. M Societe des Ingenieurs Civils de France. Consulting Highway Engineer, N. Y. C. Municipal Journal, January 11. 10 cts.

Streets:

Street Paving in San Francisco. Basalt blocks for heavy traffic, brick for steep grades and asphalt and bituminous concrete for easy grades; methods of constructing base and wearing surface; grading streets; cost. 3 ills., 2,000 words. Municipal Journal, January 4. 10 cts.

Street Paving in San Francisco. Where brick pavements are used and how laid; use of asphalt pavements; asphalt repairs; rock asphalt. 5 ills., 1,600 words. Municipal Journal, January 18. 10 cts.

Paving in Winnetka. Method of improving macadam streets of the village of Winnetka, Ill., described by H. L. Woolhiser, business manager of village. 300 words. Municipal Journal, January 25. 10 cts.

What Is a Street? Editorial discussion on the correct use of the word; term should include all parts of the way—roadway, gutters and sidewalks, and not alone that part of a highway intended for vehicles. 500 words. Municipal Journal, January 18. 10 cts.

Grade Crossings:

Grade Crossing Elimination Procedure. Summary of laws, methods of carrying on work and distribution of the cost in several states. From a paper presented at the meeting of the American Association of State Highway Officials, Chicago. By M. W. Watson, acting state highway engineer, Kansas Highway Commission. 3,000 words. Good Roads, January 18. 10 cts.

Summary of State Laws for Elimination of Railroad Grade Crossings. Collected by the Kansas Highway Commission and summarized by M. W. Watson, acting state highway engineer of Kansas. From a paper presented at the meeting of the American Association of State Highway Officials. 2,300 words. Engineering and Contracting, January 1. 15 cts.

Maintenance:

English Experience with Road Corrugation. Indicating probable causes of the trouble, with some suggestions for preventing or alleviating it. Abstract of paper presented before the Institution of Civil Engineers by Ernest L. Leming. 1,000 words. Engineering and Contracting, January 1. 15 cts.

Patrol Method of Road Maintenance as Employed in Maine. In charge of State Highway Commission; selection and wages of patrolmen; cost of maintenance by patrol system. 1,200 words. Engineering and Contracting, January 1. 15 cts.

Performance of New Jersey Highways Under Heavy Motor Truck Traffic. Light pavement base broken down; failure to remove snow costly; maintenance difficulties. By W. G. Thompson, state highway engineer, Trenton, N. J. 1,700 words. Municipal and County Engineering, January. 25 cts.

French Roads and the War. Transportation by truck for the American army has made necessary resurfacing hundreds of miles of road; equipment and men needed. By E. A. Kingsley, major of engineers, A. E. F. 1,300 words. Municipal Journal, January 25. 10 cts.

Pavements:

Latest Seattle Specifications for Brick Paving are for the Monolithic Type. Why sand filled pavements fail; author prefers cement grout filler. By W. H. Tiedeman, assistant city engineer, Seattle. 1,800 words. Municipal and Country Engineering, January. 25 cts.

Bituminous Surfaces in York County, Ont. Ideas developed in connection with the building and maintaining of water-bound and bituminous-bound macadam roads. Paper read at the meeting of the Ontario Good Roads Association. By E. A. James, engineer, Toronto and York Highway Commission. 1,800 words. Canadian Engineer, January 16. 15 cts.

Experience with Sand Clay Road Surfacing in Nebraska. Properties of the materials and where they are found; mixture of sand and clay. By Geo. E. Johnson, state engineer of irrigation, highways and drainage, Lincoln, Neb. 3 ills., 1,500 words. Municipal and County Engineering, January. 25 cts.

Miscellaneous:

Marking and Mapping the Wisconsin Trunk Line Highway System. Trunk lines are numbered in order of their length in miles; marking covers 5,300 miles. From a paper by A. R. Hirst, presented at a joint session of the fourth annual meeting of the American Association of State Highway Officials and the annual meeting of the Highway Industries Association. 3 ills., 1,700 words. Good Roads, January 11. 10 cts.

One Course Sidewalks Feature of Donora Concrete Housing Development. Contract was let for approximately 25,000 square feet of 5-foot walk, 4½ inches thick. 2 ills., 600 words. Engineering and Contracting, January 1. 15 cts.

Characteristics of War-time Highway Work in Great Britain and the United States. War conditions have been injurious to roads in both countries and immediate maintenance is necessary; each has recognized the importance of better systems, nationally organized. 4,600 words. Engineering News-Record. January 9. 20 cts.

The Federal Aid Road Law; Experience to Date and Suggestions for Better Co-operation. By the late Logan Waller Page, for many years director of the U. S. Bureau of Public Roads. Paper prepared for presentation at the fourth annual meeting of the American Association of State Highway Officials at Chicago. 10 ills., 3,700 words. Municipal and County Engineering, January. 25 cts.

Boulevards of San Francisco, California. Notes on the history and construction of the scenic drives in and near the Golden Gate city. By Charles W. Geiger. 5 ills., 2,200 words. Good roads, January 4. 10 cts.

Proposed Route for a New York-Chicago Trunk Line Highway. Suggestion that it follow the New York Central Railroad through New York State. By J. Y. McClintock, county superintendent of highways, Monroe county, N. Y. 400 words. Good Roads, January 18. 10 cts.

How the Successful Campaign for the $60,000,000 Good Roads Bond Issue Was Conducted in Illinois. Wide indorsement by state and local organizations; forming of county and precinct organizations; publicity through newspapers, literature and motion picture film; financing the campaign. By S. E. Bradt, state superintendent of highways, Springfield, Ill. 1 chart, 2,800 words. Municipal and County Engineering, January. 25 cts.

Carrying Good Roads to Japan. Dinner given in Tokyo by Samuel Hill, former president of the American Road Builders' Association, inaugurates movement for highway improvement. By Lawrence William Pedrose. 1 ill., 700 words. Good Roads, January 18. 10 cts.

Proposed Federal Aid Measures. Various bills for government participation in highway improvement introduced in the Senate and House of Representatives. 900 words. Good Roads, January 4. 10 cts.

State Highway Work in 1919. Reports on plans for the work of the coming road building season from leading commonwealths indicate year of renewed activity. 3,200 words. Good Roads, January 4. 10 cts.

Engineers for Highway Work. Inadequate pay of highway engineers; placing entire responsibility for county road management on highway engineer; cooperation of highway departments and colleges. 600 words. Engineering and Contracting, January 1. 15 cts.

Eastern Ontario Good Roads Association. Loses its president, who has moved to Toronto; resume of the good work accomplished since last July by this energetic organization. 1 ill., 600 words. Canadian Engineer, January 16. 15 cts.

SEWERAGE AND SANITATION.

Sewer Construction:

Rosedale Creek Sewer Extension, Toronto. Circular brick sewer 2,598 feet 6 inches diameter, one per cent. grade; constructed partly in tunnel, using compressed air. 4 ills., 1,300 words. Canadian Engineer, January 23. 15 cts.

Rideau River Intercepting Sewer, Ottawa. Most interesting part of the work was the tunneling under railway tracks. 6 ills., 1,500 words. Canadian Engineer, January 2. 15 cts.

Light and Heavy Equipment Compared on Identical Sewer Construction. Field costs per unit of sewer are substantially the same for both plants; greater speed possible with heavier plant, according to results obtained. By Ralph H. Burke, division engineer in charge of sewer work, Sanitary District of Chicago. 3 ills., 3 tables, 1,500 words. Engineering News-Record, January 23. 20 cts.

Stream Pollution:

Dissolved Oxygen as Index of Pollution. A distinct difference between summer and winter saturations; less danger from pollution in cold weather; worst conditions are found near sewer outlets. By Kenneth Allen, engineer of sewage disposal, Board of Estimate and Apportionment, New York. 1,200 words. Fire and Water Engineering, January 22. 15 cts.

Dissolved Oxygen as Index of Pollution. Tests begun by the Metropolitan Sewerage Commission in 1909 in New York City have been continued by the Board of Estimate and Apportionment to the present time, and show a surprising and persistent decline in the degrees of saturation in all parts of the harbor. 900 words. Engineering and Contracting, January 8. 15 cts.

Sewage Treatment:

Fine Screens and Chlorine Meet Daytona Condition. Ample dilution; chlorine removes 80% of bacteria; Imhoff tanks elsewhere more efficient than screens at Daytona. By George W. Simons, Jr., sanitary engineer, State Board of Health, Jacksonville, Fla. 2 tables, 1,600 words. Engineering News-Record, January 9. 20 cts.

Performance of the Ransome Drifting Sand Filters at Toronto, Ont. Plant fulfills requirements; chloramine treatment at Ottawa. 1 ill., 800 words. Municipal and County Engineering, January. 25 cts.

Design and Operation of Fort Meyer Sewage-Treatment Plant. Pioneer among standard camp sewage works consists of one-story tank, dosing chamber and sprinkling filters; low first costs; produces good effluent. By Leonard S. Doten, Major, Quartermaster Corps., Sanitation Section, War Dept., Washington. 3 ills., 1,800 words. Engineering News-Record, January 30. 20 cts.

Treatment and Disposal of Creamery Wastes. Settling tank and sandbed designed and tested by United States Public Health Service gives satisfactory results. By Earle B. Phelps, professor of chemistry, Hygienic Laboratory, U. S. Public Health Service. 1 ill., 2 tables, 1,800 words. Municipal Journal, January 25. 10 cts.

Sanitation:

Sanitary Engineers Get Direct Results in East Indian Mining Camp. Experience at Namtu is typical of tropical sanitation in rural India; jungle cleaning and drainage are successful measures in mosquito suppression; local conditions and habits. By Harry N. Jenks, sanitary engineer, Burma Mines, Limited, Namtu, Burma. 4 illus., 3,000 words. Engineering News-Record, January 23. 20 cts.

Medical Inspection at Miami Camps checks Influenza. First aid hospitals, local doctors and chief district physician held back epidemic at five conservancy dams. 2 ills., 700 words. Engineering News-Record, January 23. 20 cts.

Xenia's Typhoid Epidemic. After investigation the State Department of Health attributed the epidemic to defective hypochlorite used as a disinfectant. 500 words. Municipal Journal, January 11. 10 cts.

Our Duty to the Returning Soldiers—and Ourselves. United States Public Health Service is pointing out the duty of clearing the nation from vice diseases, which war demonstrated were the prime causes of inefficiency within the nation. 600 words. Municipal Journal, January 4. 10 cts.

WATER SUPPLY.

Construction:

The Water Supply of Montevideo, Uruguary. Cement used in construction of the concrete reservoir was of the slow-setting quality. Concluded from Jan. 1 issue. 10 ills., 1,800 words. Engineering World, January 15. 15 cts.

Chicago Water Works Intake Crib Tilted Level with Screw Jacks. Lopsided appearance of new superstructure corrected by unique engineering operation; instrument man on center tower controlled moves by means of twenty-four level targets. 4 ills., 1,300 words. Engineering News-Record, January 30. 20 cts.

Raising Two Lines of 24-inch Water Main Seven Feet. Screw rods operating through timber cross-blocks supported on piles were recently used for this purpose at Boston, by the Boston & Lockport Block Co., in connection with the extension of its plant. By Fred J. Sauer, Jr. 2 ills., 1,300 words. Engineering News-Record, January 30. 20 cts.

Methods Employed in Lowering a 12-Inch Water Main Under Full Pressure. From the report of the water commissioners of Middletown, Conn. 600 words. Municipal and County Engineering, January. 25 cts.

War Wage Increase Met by Revising Construction Plan. Concrete output multiplied sixfold on new St. Paul reservoir by changing method of operating traveling mixing plant. 5 illus., 2,000 words. Engineering News-Record, January 9. 20 cts.

Materials:

Lead Pipe Couplings. Discussing the joints commonly used in service pipe connections and the development that has taken place, for the purpose of improvement and prolonging the life of the service and its various appurtenances. By John A. Jensen, supervisor, Minneapolis Water Works. 2,000 words. Canadian Engineer, January 2. 15 cts.

Reinforced Concrete Pressure Pipe. Experience gained lately shows that concrete properly made and sufficiently reinforced will resist safely internal and external stresses up to 100 pounds per square inch. Paper read before the Illinois Section of the American Water Works Association. By Coleman Meriwether. 2 ills., 2,000 words. Canadian Engineer, January 16. 15 cts.

Growing Demand in Foreign Countries for American Made Pipe and Fittings. Remarkable increases in the export to Mexico, Japan and Canada. 600 words. Fire and Water Engineering, January 8. 15 cts.

Frozen Pipes:

Protection Against Freezing. How Winnipeg's water mains, fire hydrants and valves are taken care of during the winter. By T. H. Hooper, operating supt., Winnipeg Water Works. 700 words. Canadian Engineer, January 23. 15 cts.

Cold Weather and Mains in Duluth. Experiences with freezing and thawing of water and gas mains; services thawed by electricity; ground froze 8 feet deep. 2,000 words. Municipal Journal. January 4. 10 cts.

Thawing Frozen Water Mains. Excerpts of a report by a committee appointed by the New England Water Works Association to investigate conditions caused by the severe winter of last year as regards frozen water mains and services. 1,300 words. Fire and Water Engineering, January 8. 15 cts.

Maintenance:

Results of Cleaning Water Mains at St. Louis. Carrying capacity in certain sections of the distribution system nearly doubled. 4 ills., 300 words. Engineering and Contracting, January 8. 15 cts.

The Cleaning of Water Mains. Service of water pipes lengthened by cleaning the pipes by mechanical means; several methods now in use. 2 ills., 400 words. Fire and Water Engineering, January 1. 15 cts.

Water Main Cleaning in St. Louis. Methods and results in cleaning 50 miles of mains; from 85 to 93 per cent increase in capacity. 4 ills., 700 words. Municipal Journal, January 4. 10 cts.

Water Waste Checked in Buffalo. Condition greatly improved by water department; house-to-house inspection, repairs of leaks and other methods effect the desired result. 1,300 words. Fire and Water Engineering, January 1. 15 cts.

Water Works Conservancy. Combating water waste and leakage; 20 per cent of water lost; education to prevent waste. By Arthur A. Reimer, consulting engineer, East Orange, N. J. 4,500 words. Municipal and County Engineering, January. 25 cts.

Effect of War Conditions on the Operation and Maintenance of Waterworks. Cost of principal materials and supplies, 1914-1918; inadequacy of many waterworks, due to lack of construction work during the war, a menace to public health. From the report of the committee on water supplies, American Public Health Ass'n. 1,500 words. Municipal and County Engineering, January. 25 cts.

Waterworks Operation; Reservoir Maintenance. Investigating leakage from reservoirs: causes of leakage; locating leaks; stopping leaks by use of cement, asphalt, clay, etc. 3,800 words. Municipal Journal. January 4. 10 cts.

Waterworks Operation: Reservoir Maintenance. Preventing pollution of the reservoir from the catchment area; preventing erosion; objectionable features of swamps. 2,000 words. Municipal Journal, January 18. 10 cts.

Waterworks Operation — Reservoir Maintenance. Forestry on catchment areas; the advantages, methods and costs; some figures and results from practice. 2,800 words. Municipal Journal, January 25. 10 cts.

Meters:

Selection of Service Meters. Economy and efficiency should be determining principles; practices and experiences of Passaic water company in use of meters; a period of twenty years covered and 22,000 meters handled. By W. R. Edwards, ass't supt., Passaic (N. J.) Water Co. 1,300 words. Fire and Water Engineering, January 29. 15 cts.

Sizes of Service Meters. Practices and experience of the Passaic Water Company in the use of meters, especially as to the sizes most desirable. By W. R. Edwards, assistant superintendent Passaic Water Company. 1,500 words. Municipal Journal, January 4. 10 cts.

Rates and Duration of Flow in Service Pipes. Investigation of apparatus for recording flow in service pipes, made by Mr. J. E. Garratt at the suggestion of the writer. By Caleb Mills Saville, manager and chief engineer, water department, Hartford, Conn. 2 ills., 2 tables, 1,500 words. Engineering and Contracting, January 8. 15 cts.

Rates:

Division of Water Revenues. Important correspondence on this subject; inquiry as to increasing a city's general revenue by raising water rates and Superintendent O'Schaughnessy's reply. 1 ill., 700 words. Fire & Water Engineering, January 15. 15 cts.

Maintenance of Public Utilities Plants. Old rates now insufficient; effect of war conditions; waterworks rehabilitation. By Robt. J. Thomas, supt. of waterworks, Lowell, Mass. 700 words. Municipal and County Engineering. 25 cts.

Purification:

Operating Features of the Chain of Rocks Filter Plant. During 1917-1918 38,612 million gallons of water were filtered at a cost of $2.74 per million gallons, including the cost of operation, maintenance, repair, light and power, coal and the chemicals used in the applied and filtered water. 1,500 words. Engineering and Contracting, January 8. 15 cts.

Notes on Chlorine Treatment of London, England, Water Supply. Superchlorination and de-chlorination. From the report of Dr. A. C. Houston, director of water examination, Metropolitan Water Board, London. 1,000 words. Municipal and County Engineering, January. 25 cts.

Taking a Chance with an Unsafe Water Supply Proves Costly. Imperfect disinfection of part of the water supply at Xenia, O., was responsible for the outbreak of 44 cases of typhoid fever in the fall of 1918. 700 words. Municipal and County Engineering, January. 25 cts.

Find Cause of Obnoxious Tastes in Milwaukee Water. Coal tar derivatives from coke and phenol plants produce taste when diluted one part in 500 mil-

lion. By H. P. Bohmann, supt., Milwaukee waterworks. 2,300 words. Engineering News-Record, January 23. 20 cts.

Chlorination of Chicago's Water Supply. Installation of apparatus; description of the aerisostat. By John Ericson, C. E., city engineer of Chicago. 1 ill., 2,100 words. Municipal and County Engineering, January. 25 cts.

Need of Certain Investigations for Increasing the Efficiency of Water Filter Plant Design and Operation. Most efficient mix with least loss of head; time and intensity of agitating water; mechanical agitation; securing ideal coagulation. By James W. Armstrong, filtration engineer, water department, Baltimore, Md. 1,400 words. Municipal and County Engineering, January. 25 cts.

Billings Waterworks Notes. Superintendent Willett recommends using existing earth settling basins when the river is most turbid, to secure sedimentation of the suspended matter before coagulants are applied. 300 words. Municipal Journal, January 11. 10 cts.

Wash Troughs for Rapid Sand Filters. Results of investigation to determine surface curves for flow of water in wash water troughs; development of formula of assistance to designers. By Frank V. Fields, Cornell University. 2 ills., 2 tables, 1,600 words. Fire and Water Engineering, January 8. 15 cts.

Irrigation:

Some Financial, Agricultural and Engineering Aspects of Irrigation. Growth of irrigation in the United States; choice of land; financing; water supply, the greatest single factor. By Chas. Kriby Fox, consulting and contracting engineer, Pomona, Cal. 2,400 words. Municipal and County Engineering, January. 25 cts.

Rural Water Supplies. Primitive systems in use in Northwestern Canada; community reservoirs and springs; the coulee utilized to form water supply; Saskatchewan dry in southwest, wet in northeast. By E. L. Miles, inspecting engineer, department of irrigation, province of Saskatchewan. 3 ills., 2,300 words. Fire and Water Engineering, January 22. 15 cts.

Actual Quantities of Water Used on Irrigation Projects of U. S. Reclamation Service. General data on the experience of the Service in the use of water on its several irrigation projects, given by E. A. Moritz, engineer of the Service, in the Reclamation Record. 1 table, 1,500 words. Engineering and Contracting, January 8. 15 cts.

Miscellaneous:

Philippine Water Supplies Get Strict Sanitary Supervision. Good water reduces death rate 50 per cent; government encourages wells by paying two-thirds cost; amoeba normally in water not removed by filtration but not disease producers. By Geo. W. Heise, Saltville, Va., former chief of the section of water analysis, Bureau of Science, Philippine Islands. 3,600 words. Engineering News-Record, January 30. 20 cts.

Portsmouth Waterworks. Reported upon last month by the National Board of Fire Underwriters; $1,000,000 expenditure authorized by the Federal government for improvements. 300 words. Municipal Journal, January 18. 10 cts.

The New England Waterworks Association. Annual meeting at Boston; new officers elected for the ensuing year and an ambitious program outlined for the Association's activities. 2,600 words. Fire and Water Engineering, January 15. 15 cts.

LIGHTING AND POWER.

Water Power Resources:

Investigation of Maine Water Powers. Public utilities commission sends to governor and council the result of an exhaustive study of water-power resources; hydroelectric systems, power sites, plant locations and storage conditions dwelt on. 1 map, 1,300 words. Electrical World, January 18. 15 cts.

Recent Hydroelectric Development in Tasmania. 70,000 hp. now made available and other more promising development to be started; electrical construction peculiar to that system; a new field for electric apparatus opened in the Antipodes. By L. W. Alwyn-Schmidt, N. Y. Economic Service Bureau. 4 ills., 1,600 words. Electrical World, January 11. 15 cts.

Factors Retarding Water-Power Development. And the advantages gained by utilizing available water resources; efficiency of the steam turbine a big consideration. By D. H. Colcord, Westinghouse Electric & Mfg. Co., Pittsburgh. 1,100 words. Canadian Engineer, January 23. 15 cts.

Water Power Resources Conference at Ottawa. Dominion and provincial officials in charge of water power administration meet with members of Dominion Power Board and discuss coordination of investigations and administration; water resources index-inventory scheme adopted. 1,700 words. Canadian Engineer, January 23. 15 cts.

Steam Plants:

Selecting Coal for Power Plant Use. Article pointing out characteristics of various coals; influence of coal upon furnace-chamber proportions; purchase of coal. By Robert June, mechanical engineer. 4 ills., 3 tables, 3,000 words. Electrical Review, January 18. 30 cts.

Conservation of Heat Losses from Pipes and Boilers. Complete detailed method of calculating and solving heat losses; economic solution to practical applications; abstract A. S. M. E. paper. By Glen D. Bagley, engineer, Mellon Institute of Industrial Research. 9 ills., 4 tables, 3,000 words. Electrical Review, January 18. 30 cts.

New Plant of the Appalachian Power Company. Steam station rated at 20,000 kw. just completed to supplement hydroelectric plants in meeting heavy industrial requirements; development of rich mining district due largely to central-station power supply. By H. S. Slocum, engineer with Vielé, Blackwell & Buck. 9 ills., 2,600 words. Electrical World, January 18. 15 cts.

Electric Plants:

Features of Three-Phase-Two-Phase Generating Station. Addition to Eastern Wisconsin Electric Company's Sheboygan plant comprises interesting installation and operating features. 9 ills., 1 table, 1,600 words. Electrical Review, January 18. 30 cts.

Economical Operation of Hydraulic Turbines. Cleanliness, care and upkeep are the important factors in obtaining maximum efficiency. By Eugene U. Gibbs. 1,500 words. Canadian Engineer, January 9. 15 cts.

An Operating View of High-Tension Insulators. Severe operating conditions that have caused failure of line insulators; later design of pin and suspension types promise to solve insulator problem for some years to come. By P. Ackerman, electrical engineer, Toronto Power Co. 4 ills., 4,400 words. Electrical World, January 18. 15 cts.

Extension to the Ontario Power Co.'s Plant. Construction of 1.3 miles of 13.5 ft. miameter wood staves pipe for 50,000 H.P. capacity, an[illegible] of one of the largest differential surge tanks ever built; power house designed to withstand water pressure to crane rail. By Thos. H. Hogg, ass't hydraulic engineer, Hydro-Electric Power Commission of Ontario. 23 ills., 6,000 words. Canadian Engineer, January 16. 15 cts.

Lighting:

Use of Electric Instruments to Measure Gas. Description of gas-making process and application of Thomas meter, as recently installed by Laclede Gas Light Co. 2 ills., 1,300 words. Electrical Review, January 11. 30 cts.

Electric Lighting Plant Among the Essentials on the Modern Farm. How living conditions have improved on the farm; farmer wants electrical conveniences and will pay freely for them. By George W. Hill. 3,000 words. Electrical Review, January 25. 30 cts.

FIRE DEPARTMENT.

Fire Departments:

The Boston Fire Department. Report of the committee on fire prevention of the National Board of Fire Underwriters on conditions in the department; conclusions and recommendations. 1,000 words. Fire and Water Engineering, January 8. 15 cts.

Problems of the Small Town Fire Department. Acetylene gas fire fought with chemicals; local firemen have fought fires in Emmet, Kan., with an equipment consisting of ten 3-gallon chemical fire extinguishers. 1,000 words. Fire and Water Engineering, January 8. 15 cts.

Annual Reports. Majority of chiefs show smaller fire losses in 1918 than in previous year. 1,500 words. Fireman's Herald, January 18. 10 cts.

Fire Departments in American Cities. Giving statistics of the 219 American cities estimated to have more than 30,000 inhabitants. 1,500 words. Pacific Municipalities, January. 25 cts.

Chief Kenlon on Bravery. The head of the New York Fire Department tells of difference between the old and present department; men are more scientific, but as brave as ever; some heroic instances cited. 1 ill., 1,600 words. Fire and Water Engineering, January 29. 15 cts.

Fire Prevention:

Press Cooperation in Fire Prevention. The assistance of the daily and weekly press of the utmost importance; the best medium to reach the masses; class journals also should be called upon to help in spreading the doctrine of fire prevention. By Alfred Fleming, president of the Fire Marshals' Ass'n of North America. 1 ill., 1,600 words. Fire and Water Engineering, January 22. 15 cts.

Individual Liability for Fires Due to Carelessness or Neglect. Object sought in securing for a municipality penal responsibility for fires due to carelessness, is the prevention of fires; city ordinance suggested. By Chief Frank L. Hilton, Alhambra, Cal. 900 words. Fire and Water Engineering, January 1. 15 cts.

Fire Walls and Horizontal Fire Escapes. Views of two chiefs of Canadian departments on these important matters; confining the fire area of immense importance; the tower stairway. By Chief Wm. J. Early, St. Catherines, Ont., and Chief Jas. Corbett, Toronto, Ont. 2,000 words. Fire and Water Engineering, January 8. 15 cts.

Fire Fighting:

Boston High Pressure System. Completion being considered; first advocated ten years earlier and partly installed but never put into operation; additional motor apparatus and rearrangement of districts part of plans for coming year; rescue company a feature. 2 ills., 2,000 words. Fire and Water Engineering, January 15. 15 cts.

Emergency Wrecker of the Boston Fire Department. Apparatus has rendered wonderfully efficient service since it was installed about two years ago. By H. Belknap. 1 ill., 800 words. Fire and Water Engineering, January 15. 15 cts.

Forest Fires in Montana. The state fire marshal describes the work of his department in handling and preventing conflagration in the immense forest preserves. By E. A. Eklund. 1 ill., 2,500 words. Fire and Water Engineering, January 1. 15 cts.

The Fire Alarm Telegraph. Influence of modern discoveries on the system; history of transmission of alarms by wire; discoveries not always accidental. By James B. Yeakle, supt. of fire alarm telegraph, Baltimore. 2,000 words. Fire and Water Engineering, January 22. 15 cts.

TRAFFIC AND TRANSPORTATION.

Highway Traffic:

Regulation of the Speed, Weight, Width and Height of Motor Trucks and Trailers. Abstract of paper presented at the joint session of the American Ass'n of State Highway Officials and the Highway Industries Ass'n at Chicago. By George M. Graham, chairman, motor truck committee, National Automobile Chamber of Commerce. 2,300 words. Good Roads, January 25. 10 cts.

Segregating Traffic. Comments on regulations adopted for New York City and modifications recommended. 700 words. Municipal Journal, January 25. 10 cts.

Proposed Uniform Law for Regulation of Speed and Dimensions of Motor Trucks. Manufacturers agree on uniform truck law; responsibility of trucks for damaged condition of roads. By George M. Graham, chairman National Motor Truck Committee of National Automobile Chamber of Commerce. 1 table. 1,600 words. Engineering and Contracting, January 1. 15 cts.

Proper License Fees for Motor Vehicles and Drivers. Public should pay for the construction of roads, and vehicles be taxed for the maintenance. From a paper presented at the joint session of the American Ass'n of State Highway Officials and the Highway Industries Ass'n., Chicago. By H. E. Breed, first deputy commissioner, N. Y. Commission of Highways. 2,700 words. Good Roads, January 11. 10 cts.

Censuses Show Three Fold Increase in Traffic on Massachusetts Highways in 9 Years. Interesting data given by Col. W. D. Sohier, chairman of the State Highway Commission, at a meeting of the Ass'n of State Highway Officials. 1,400 words. Engineering and Contracting, January 1. 15 cts.

Miscellaneous:

The Fuel Administration and the Skip-Stop. How the Federal government and the electric railways cooperated in several ways to save fuel, with special reference to eliminating unnecessary stops. By J. F. Layng, General Electric Co. 5 ills., 5,000 words. Electric Railway Journal, January 4. 15 cts.

Collecting Zone Fares in Boston. Professor Richey shows that two-zone plan for Boston elevated railway is best first step toward the ideal; proposes a concrete plan for getting the fares. 1 ill., 4,800 words. Electrical Railway Journal, January 18. 15 cts.

Committee Analyzes Track-Elevation Costs or Rock Island Work in Chicago. Book figures are redistributed, freight charges and other elements of expense estimated and added in, to obtain complete unit costs for fifty items on $2,700,000 improvement. 2,400 words. Engineering News, January 9. 20 cts.

Transportation and Power. Energy must be shipped in bulk unless special transportation facilities are provided for the concentrated product; common carriers needed for power. By C. G. Gilbert and J. E. Pogue, Division of Mineral Technology, U. S. National Museum. 3,000 words. Canadian Engineer, January 9. 15 cts.

STREET CLEANING AND REFUSE DISPOSAL.

Street Cleaning:

Street Cleaning Report for Rochester. Recommendations for organization of force, municipalization of collection service and purchase and use of equipment; data concerning work done by street cleaning force; stables and shops. 2 ills., 1 table, 3,000 words. Municipal Journal, January 18. 10 cts.

The Streets of Washington, D. C. Editorial expressing the hope that the capital will pay more attention in the future to civic cleanliness, neatness and orderliness. 600 words. Municipal Journal, January 11. 10 cts.

Consideration of Health Important factor in Determining Extent of Street Cleaning. From the report of G. H. Norton, Rudolph Herring and R. C. Harris, submitted to the last annual convention of the American Society of Municipal Improvements. 400 words. Engineering and Contracting, January 1. 15 cts.

Snow Removal:

Snow Sweepers Made from Open Cars. Emergency conditions made unusual procedure necessary; cost was less than $900 per sweeper. By J. W. Hume, supt. of equipment, International Railway Co., Buffalo, N. Y. 2 ills., 700 words. Electric Railway Journal, January 18. 15 cts.

Electric Railway Snow Fighting Equipment and Its Applications. Use of brushes, snow scrapers, sweepers, plows, flangers, etc. 1,300 words. Engineering and Contracting, January 15. 15 cts.

Snow Removal from New York State Highways. Save the sleighing; snow removal equipment; local choice of routes. By Enwin Duffey, state commissioner of highways, Albany. 1,400 words. Municipal and County Engineering, January. 25 cts.

Refuse Disposal:

Garbage Disposal in New York. Statement made by Louis L. Tribus of New York City, commenting on that portion of the report of the Pittsburgh committee referring to New York City. 250 words. Municipal Journal, January 4. 10 cts.

Street Cleaning and Refuse Disposal in Savannah. Itemized and unit costs of cleaning different kinds of pavements; destructor expenditures and credits; oiling catch basins. 1 table, 1,000 words. Municipal Journal, January 18. 10 cts.

National Waste Reclamation. Promotion work to be taken over by Department of Commerce as a permanent waste reclamation service; value of materials reclaimable. 1,000 words. Municipal Journal, January 18. 10 cts.

MATERIALS AND STRUCTURES.

Use of Crushed Stone. Figures given out by the U. S. Geological Survey showing the sales of this material in 1917; more than 40 million tons valued at more than $29,000,000. 400 words. Municipal Journal, January 18. 10 cts.

Concreting in Cold Weather. Suggestions for carrying on concrete construction in cold weather, abstracted from a pamphlet issued by the Portland Cement Association. 1,500 words. Municipal Journal, January 4. 10 cts.

Temperature Record of Cold Weather Concrete. Simple and inexpensive method of securing temperature records described by L. J. Towne in the December Stone and Webster Journal. 2 ills., 1,000 words. Engineering and Contracting, January 12. 15 cts.

Experimental Data on Wood-Blocks; Use of Zinc-Treated Ties. Progress reported on wood-block experiments in Minneapolis. Extracts from two papers presented at the meeting of the American Wood Preservers' Ass'n at St. Louis. By C. H. Teesdale, J. D. MacLean and S. W. Allen. 1 ill., 2,100 words. Engineering News-Record, January 30. 20 cts.

The Franklin-Orleans Bridge. This bridge is an unusually long one for a double-leaf trunnion bascule structure; in progress of construction over the Chicago River. 7 ills., 1,000 words. Engineering World, January 15. 15 cts.

Holding a Bulging Retaining Wall with Buttresses. High fill of slippery material forces out dry wall; grouting and buttresses solve difficulty satisfactorily. 4 ills., 1,000 words. Engineering News-Record, January 23. 20 cts.

Big Eddy Conservation Dam. Being erected near High Falls, on the Spanish River, by the International Nickel Co., at an estimated cost of $1,750,000; general dimensions. 2 ills., 700 words. Canadian Engineer, January 9. 15 cts.

GOVERNMENT AND FINANCE.

Public Ownership, Public Control, or What? Editorial comment on the changes that seem impending in the relations between public service corporations and the public as represented by city, state and federal governments. 700 words. Municipal Journal, January 4. 10 cts.

Why Municipal Ownership Sometimes Fails. Editorial comment on the discharging of 350 engineers employed on the subways of New York City, on December 31. 700 words. Municipal Journal, January 25. 10 cts.

Promote the Welfare of the Community. All forms of autocracy should be deposed in our own country also; rule of reason necessary in reconstruction, and capital and labor alike will have to abandon all autocratic methods; reforms that are essential. By Carl Hering. 2,400 words. Electrical World, January 11. 15 cts.

Recent Developments in Service-at-Cost Franchises for Utilities. The principal provisions of the various service-at-cost franchises of electric railway companies are described with great care and compared as to results; conclusions drawn as to the most desirable forms of such a franchise. By L. R. Nash, Stone & Webster, Boston, Mass. 2 ills., 23,000 words. Electric Railway Journal, January 4. 15 cts.

Boulder's Budget. The first comparative budget of the city prepared by City Manager E. O. Heinrich, shows completeness combined with conciseness and simplicity. 250 words. Municipal Journal, January 11. 10 cts.

Special Assessments for Local Improvements. Information collected by the secretary of the N. Y. State Ass'n of Mayors and other city officials on the practice of cities in levying and collecting assessments. 800 words. Engineering and Contracting, January 1. 15 cts.

Recent Events and Utility Valuation. The great war has changed the practice of considering past cost proper measure of value; value not constant, but subject to fluctuation. By J. W. Alvord, consulting engineer, Chicago, 1 ill., 3,000 words. Fire and Water Engineering, January. 15 cts.

Finances of Cities: 1917. Figures given of the revenues, expenditures and indebtedness of the larger cities of the country; in 129 of the 219 cities of more than 30,000 population, the excess of expenditures for governmental costs over revenues amounted to $69,461,352, or $3.90 per capita. 1,300 words. Pacific Municipalities, January. 25 cts.

Combined Purchasing of Machinery and Supplies for Municipalities. Cities and towns could save many thousands of dollars annually through the medium of central purchasing plan. By W. G. McMillan, state purchasing agent, California. 2,300 words. Pacific Municipalities, January. 25 cts.

Inadequate Salaries. Being paid to municipal engineers: Chicago chapter of the American Association of Engineers makes strong protest to mayor and city council. 800 words. Canadian Engineer, January 2. 15 cts.

MISCELLANEOUS.

Chicago Plan Commission Proposes Great Improvement Scheme. Widening and extending Michigan and a number of other avenues and removal and revision of terminals, included in the program for the development of the city. 1 ill., 700 words. Engineering News-Record, January 23. 20 cts.

Housing Construction at Craddock. Building a project near the Portsmouth Navy Yard to provide homes for five thousand workers; distributing railroad; central concrete plant; concrete delivered by tractors; progress clock. 4 ills., 1,300 words. Municipal Journal, January 25. 10 cts.

Construction Features of Government Housing Development at Craddock, Va. Building a complete city capable of housing more than 5,000 people; parks, playgrounds, town squares and boulevard system, encircling the city, provided; distributing railroad. 4 ills., 1,000 words. Engineering and Contracting, January 15. 15 cts.

Survey of Baltimore's Boundary. Legislature of Maryland passes an act in March, 1918, providing for annexing additional areas to the city. 500 words. Municipal Journal, January 11. 10 cts.

Relation of the Curve to Town-Planning. Not a single straight street line in some plans; some others show curved lot boundaries; discussion of methods employed in laying out curves for street or lot lines; new handbook of curve tables required. By H. L. Seymour, town planning assistant, Commission of Conservation. 4 ills., 2,300 words. Canadian Engineer, January 9. 15 cts.

Topographical Surveys in Connection with Rural Planning. Soil and land surveys for assessment purposes; what a topographical sheet should show. By W. H. Norrish, from paper at the meeting of the Ass'n of Dominion Land Surveyors. 1,000 words. Engineering and Contracting, January 1. 15 cts.

Municipal Peace Readjustment. How American cities are planning to solve this problem; public works which will be constructed; opinion of municipal officials. Report at meeting of Mayors and Other City Officials of State of New York, by Mark I. Koon, Mayor of Auburn. 3,000 words. Municipal Jaurnal, January 25. 10 cts.

The Rebuilding of Devastated France. Definite plan for the physical reconstruction of France and possibly all Europe. By John V. Schaeffer, M. E. 2,300 words. Engineering World, January 15. 15 cts.

The Facts on the Devastation and the Present Reconstruction Efforts in France. Detailed summary of the extent and character of the destruction, with a complete account to date of the measures, official and otherwise to re-establish the invaded regions. By Geo. B. Ford, deputy commissioner of the American Red Cross, Paris. 8 ills., 9,000 words. Engineering News-Record, January 30. 20 cts.

Plan Introduced for Reconstrucing War Devastated Countries. Disposal of immense government stores embodied in new idea of restoration. 1,000 words. Electrical Review, January 11. 30 cts.

Provide Work for Returned Soldiers. Editorial discussion on the necessity of providing immediate oportunity for soldiers to earn a living; each city or town should provide for its own citizens; when positions with private firms are not sufficient public work should be provided. 500 words. Municipal Journal, January 25. 10 cts.

Soldiers' Memorials. Editorial discussion as to what form of memorial is most desirable for the commemoration of our soldiers in the World War. 500 words. Municipal Journal, January 18. 10 cts.

Experiences at Worcester, Mass., in Public Work Construction by City Forces. Albert T. Rhodes, former street commissioner of Worcester, is of the opinion that the municipalties' forces, if properly organized, can bring about better, more durable results than by contract work. 1,300 words. Engineering and Contracting, January 1. 15 cts.

Relation Between Civil and Military Engineers. Fundamental principles remain same, but methods of application change. By Major-General Wm. M. Black, chief of engineers, U. S. A. 2,300 words. Engineering and Contracting, January. 15 cts.

Efforts to Consolidate the Engineering Profession. More federation and simplification which means elimination are advocated; problems which demand solution are outlined. By A. D. Flinn, secretary, Engineering Council, New York. 2,500 words. Engineering News-Record, January 9, 1919. 20 cts.

Political Piracy with the Engineer as Victim. Editorial comment on the action of New York City's governing body, the Board of Estimate and Apportionment, in tearing to pieces the Public Service Commission's engineering department; more than 300 engineers thrown out on a few

hours' notice. 800 words. Engineering News-Record, January 9. 20 cts.

Savannah's Department of Stables and Shops. Duties include the care and feeding of all live stock, maintenance and upkeep of all vehicles and rolling stock. 400 words. Municipal Journal, January 4. 10 cts.

Public Works Photography. In his annual report, S. Q. Cannon, city engineer of Salt Lake City, makes references to changes in the engineering department's practice in the taking of photographs and blue printing. 250 words. Municipal Journal, January 11. 10 cts.

Research Council's Work. Review of activities for the year; situation in Canada in regard to the application of science to industry. By Dr. A. B. Macallum, administrative chairman, Honorary Research Council. 1,800 words. Canadian Engineer, January 2. 15 cts.

Comparison of Railroad Terminal Projects at Cleveland. Relative advantages of lake-front project decided upon some years ago and public-square location approved by recent vote, as seen by various engineers. 3 maps, 3,300 words. Engineering News-Record, January 30. 20 cts.

The Port of Seattle. Exists independently of city and county; affairs controlled and administered by a commission of the port of Seattle, which operates terminals, ferries and other facilities. By W. A. Scott. 4 ills., 1,000 words. Engineering World, January 15. 15 cts.

THE MUNICIPAL INDEX

(*Concluded from page* 57, *January* 18, 1919)

A Study of the Slip in the Calaveras Dam. Based on a survey, borings and pile drivings; consideration of materials used for steam-shovel and sluiced fill; reconstruction plans. By Allen Hazen, consulting engineer, N.Y.C. 3 ills., 6,200 words. Engineering News-Record, December 26. 20 cts.

LIGHT AND POWER.

Power Plants:

Electric Power Generation in Ontario on Systems of Hydro-Electric Power Commission. This commission, now the largest producer and distributor of electric energy in the province, was formed by the Ontario Government in 1906. Paper read before the Toronto section of the American Institute of Electrical Engineers. By Arthur H. Hull. 4,700 words. Canadian Engineer, December 12. 2,700 words, December 19. 15 cts.

Economic Operation of Steam Turbo-electric Stations. Bureau of Mines technical paper discussing fuel economy factors, load distribution between units, boiler-room and auxiliaries operation; second installment. By T. C. Hirshfeld and C. L. Karr. 2 ills., 6,200 words. Electrical Review, December 14. 30 cts.

Powdered Coal Substituted for Fuel Oil at Seattle. Puget Sound Traction, Light & Power Company completes installation in central heating plant; system electrically operated. By W. A. Scott. 4 ills., 1,700 words. Engineering and Cement World, December 1. 15 cts.

Reliability of Large Turbines. Answers to questions frequently raised regarding advisability of using larger units, reliability and problems of design; limits of commercial practicability of large units are not yet reached. By J. F. Johnson, engineer, Westinghouse Electric Manufacturing Co. 5 ills., 2,200 words. Electrical World, December 28. 15 cts.

Economic Operation of Steam Turbo-electric Stations. Bureau of Mines technical paper discussing fuel economy factors, load distribution between units, boiler-room and auxiliaries operation. By T. C. Hirshfeld and C. L. Karr. 3 ills., 5,000 words. Electrical World, December 7.

Operating Methods That Increase Economy. The methods of operation here outlined apply to plants having turbo-generators; distribution of loads on boilers and turbines and economical operation of auxiliaries discusse. By Lieut.-Col. C. F. Hirshfeld and C. L. Karr. 3 ills., 5,300 words. Electrical World, December 14. 15 cts.

Removal of Soot from Heating Surfaces and Flues. Use of salt removes heat-insulating and draft-choking soot. By Joseph Harrington, administrative engineer, U. S. Fuel Administration. 1,100 words. Electrical Review, December 7. 30 cts.

Gas:

Influences of B.t.u. on Gas Mantle Efficiency. Extract from technological paper No. 110 of the U. S. Bureau of Standards upon tests made in 1916 and giving valuable data upon the operation of mantle lamps. By R. S. McBridge, W. A. Dunkley, E. C. Crittenden, and A. H. Taylor. 3,500 words. Gas Age, December 2. 25 cts.

Selling Gas on a B.t.u. Basis Is Most Efficient Way. Reconstruction will demand the highest efficiency; commercial advantage of the Doherty rate, how it works and what it means to the gas business explained. By Robert G. Griswold. 3,000 words. Gas Age, December 2. 25 cts.

Inclined Retort Plant at Rome a Success. A recently made installation which has a creditable record for economy and also efficient operation. By S. Bent Russell. 4 ills., 2,400 words. The Gas Age, December 2. 25 cts.

Instruction for Gas Company Fitters, LV. Gas Age handbok series No. 4; a manual of good practice by the general manager of the Niagara Light, Heat and Power Co. of Tonawanda, N. Y. By George Wehrle. 1,000 words. Gas Age, December 2. 25 cts.

Finances:

Grand Jurors Discuss Financial Needs of Gas Co. The Supreme Court of Richmond county, Greater New York, is advised of the lack of co-operation of the Public Service Commission with the needs of company and gas consumers. 2,000 words. Gas Age, December 2. 25 cts.

The Relation of Public Service Commissions to the Gas Consuming Public and to the Gas Companies. Discussion of the ideas that the gas industry holds of the obligations of governmental bureaus to the public and to the gas companies, and the proper methods of procedure in such regulation and development. Paper presented before the Section on Public Utility Law of the American Bar Ass'n, Cleveland, O. By Walton Clark, D.Sc., president of Franklin Institute. 13,000 words. Journal of the Franklin Institute, December. 50 cts.

Attitude of Central Stations on Rates. Questions which are involved in war and peace adjustments of rates to meet changed economic conditions; duration of the period of high costs. 1,400 words. Electrical World. December 7. 15 cts.

Construction:

Excavation Methods and Equipment on Construction of eight and a half mile Niagara Power Canal. General features of canal; earth removal—heavy equipment; rock removal—channeling; rock drilling. 4 ills., 1,300 words. Engineering and Contracting, December 18. 15 cts.

Oxy-Acetylene Pipe Welding and Cutting. A resume of what is considered the best practice in this most useful and very generally employed method of joining metals. 8 ills., 3,500 words. Gas Age, December 2. 25 cts.

Miscellaneous:

Removing Obstacles to Power-Factor Charge. Necessity of standard method of measuring power factor and instrument that would be universally applicable; examination into the methods that are now employed in widely separated plants. By Will Brown, Electric Machinery Co. 1 ill., 2,500 words. Electrical World, December 28. 15 cts.

Conservation of Water Power in New England. Benefits of conserving power through storage developments discussed before special legislative committee on conservation of resources. 1,300 words. Electrical World, December 7. 15 cts.

The Modern Outdoor Substation. Apparatus has been developed until it is as reliable as indoor equipment, but design has not improved so much; notes on transformers, oil circuit breakers, lightning arresters, air-break switches and bus supports. By M. M. Samuels. 10 ills., 4,300 words. Electrical World, December 7. 15 cts.

Growth of Electricity Supply in the United Kingdom. Official war-time figures now available show vast increase in generating capacity and output of British electrical undertakings. 4 tables, 800 words. Electrical Review, December 28. 30 cts.

Producing Electricity at Irrigation Dams for Heating Purposes. Comparison of feasibility of hydro-electric service from Arrow Rock and Minidoka projects. 500 words. Electrical Review, December 28. 30 cts.

Extensive Use of Electricity for San Francisco Harbor. Pier, dock and street lighting; electric clock system; harbor lights and fog signals; fire-alarm and telephone system; electric repair and maintenance service; features of wiring. 4 ills., 5,000 words. Electrical Review, December 28. 30 cts.

FIRE DEPARTMENT.

How to Stop Fires Before They Begin. Such fire prevention exhibits as the one recently held in Newark, N. J., might well be made permanent municipal features. 1 ill., 1,500 words. American City, December. 35 cts.

Universal Platoons. Massachusetts fire chief expects new system to be established in every city. 1,300 words. Fireman's Herald, December 7. 10 cts.

Fire Department Problems. How they are regarded from the standpoint of a city manager. By E. O. Heinrich, city manager, Boulder, Colo. 1,000 words. Fireman's Herald, December 7. 10 cts.

New Britain's Good Idea. Commissioners think crippled soldiers should be employed for fire inspection. 400 words. Fireman's Herald, December 14. 10 cts.

Exposes the Trust. Washington State Commissioner shows enormous profits in fire insurance. 1,000 words. Fireman's Herald, December 14. 10 cts.

Chief Donoghue's Story. Tells how every precaution was taken at the Gillespie plant at Morgan, N. J. 1,200 words. Fireman's Herald, December 14. 10 cts.

Officers Want Platoons. 400 lieutenants of New York fire department join organized labor. 1,500 words. Fireman's Herald, December 14. 10 cts.

New Fire Roads Available. 1,000 miles to be kept clear of snow and enormous government system completed. 2 ills., 1,300 words. Fireman's Herald, December 21. 10 cts.

Ohio Chiefs Meet. Discussion of engineering and fire prevention problems at Columbus. 800 words. Fireman's Herald, December 21. 10 cts.

Returning Firemen. Ex-soldiers again have to pass the civil service examinations. 1,200 words. Fireman's Herald. December 28. 10 cts.

TRAFFIC AND TRANSPORTATION.

Highway Transportation:

Where Lies the Burden of Highway Transportation? Basic elements of highway transportaion are road-bed, vehicles, motive power. By Robert C. Barnett, economic engineer, Missouri Highways Transport Committee. 1 ill., 1,200 words. Good Roads, December 7. 10 cts.

A Suggested National Highway Policy and Plan. Phenomenal growth of interstate motor traffic, favorable attitude of government and people, and magnitude of problem make suggestion timely. By E. J. Mehren, editor. Paper read before Joint Highway Congress at Chicago. 5,800 words. Engineering News-Record, December 19. 20 cts.

The Three Elements of Transportation: Highways, Railways and Waterways. The transportation system of the United States not a unit, but a trinity; highways as feeders for waterways. From an address by Wm. C. Redfield, Secretary of Commerce. 800 words. Engineering and Contracting, December 4. 15 cts.

License Fees for Motor Vehicles and Drivers. Those benefited should pay for highways; theory of marginal utility that public should pay first cost, while user should pay maintenance. By H. Eltinge Breed, first deputy commissioner of highways, N. Y. State. Paper read before the Joint Highway Congress, Chicago. 3,000 words. Engineering News-Record, December 19. 20 cts.

Motor Trucks:

Regulation of Speed, Weight, Width and Height of Motor Trucks Discussed. They are essential transportation agencies, and while regulation is necessary, it should not restrict their expansion; table of proposed dimensions, speeds, weights and fees presented. By Geo. M. Graham, from a paper read before the Joint Highway Congress, Chicago. 1 table, 3,200 words. Engineering News-Record, December 19. 20 cts.

Motor Trucks and Plank Roads Help to Get Out Airplane Spruce. Heavily loaded motor trucks have been operated over unstable soils and through mountainous country, in bringing out airplane spruce from the Northern Pacific coast; this seemingly impossble feat was accomplished by the construction of specially designed plank roads. 5 ills., 3 tables, 1,100 words. Engineering News-Record, December 26. 20 cts.

Street Railways:

Problems of Reconstruction with Respect to Urban Transportation. The present street railway situation and what street railway companies are now seeking to do; wages and conditions of labor to be fixed and strikes to be outlawed. By Delos F. Wilcox, Ph.D. 3,700 words. American City, December. 35 cts.

Storage Yard Rearrangement at Kansas City. Indoor and outdoor car-storage capacity, car-handling facilities and fire protection have all been increased, almost entirely by the use of salvaged material. By A. E. Harvey, supt. of Way and Structure, Kansas City, Mo. 5 ills., 2,400 words. Electric Railway Journal, December 28. 15 cts.

Union Station Loop Operation in Denver. After years of controversy tracks are laid on depot grounds and company now gives quick service. 2 ills., 900 words. Electric Railway Journal, December 28. 15 cts.

The Problem Must Be Solved. The needs of the electric roads set forth with an outline of the new kind of franchise necessary; question is of paramount interest to the public. By P. H. Gadsden, chairman, committee of National Affairs, American Electrical Railway Ass'n. 3,500 words. Electrical Railway Journal, December 14. 15 cts.

A Two-Unit Automatic Substation. The Rhode Island Company's Substation at Oakland illustrates the latest practice in this important field; author goes into economics of automatic substation application. By Walter C. Slade, supt. of power and lines, Rhode Island Co., Providence, R. I. 13 ills., 3,900 words. Electric Railway Journal, December 14, 15 cts.

New Philadelphia Co-operative Plan. Announced by Pres. Mitten to take place of 1911 plan; organization of committees described; plan has been indorsed by employees and National War Labor Board. 1 ill., 2,000 words. Electric Railway Journal, December 28. 15 cts.

Municipal Electric Railway in Minneapolis. 200 words. Municipal Journal, December 21. 10 cts.

Efficient Operation with the Skip-Stop Service. Specially prepared by the United States Fuel Administration. 1 ill., 1,000 words. Electric Railway Journal, December 14. 15 cts.

Women Operate "One-Man" Cars in Keokuk. Results have been uniformly satisfactory; women do not lose their heads in emergencies. 1 ill., 800 words. Electric Railway Journal, December 28. 15 cts.

Scientific Regulation Needed by Railroads. Theodore P. Shonts comments upon the railroad situation, expressing doubt that city partnership idea would be applicable. 400 words. Electric Railway Journal, December 28. 15 cts.

Fares:

Zone Fare Collection As Seen by a British Tramway Manager. The methods used on a typical road are described, together with the arrangement of the stages and the type of tickets issued to passengers. 3 ills., 1,800 words. Electric Railway Journal, December 28. 15 cts.

Zone System Proposed for Boston. Two zones with fare in central zone 5, 6 or 7 cents recommended by Prof. Richey; Peter Witt prefers short zones with lower fares. 2,600 words. Electric Railway Journal, December 28. 15 cts.

STREET CLEANING AND REFUSE DISPOSAL.

Street Cleaning:

Street Cleaning in Philadelphia. Civic organizations plan to seek legislative authority for city to do its own work. 600 words. Good Roads, December 7. 10 cts.

Street Cleaning in Pittsburgh, Pa. Mechanical devices cannot render entirely obsolete the man with the broom. 4 ills., 500 words. Municipal and County Engineering, December. 25 cts.

Patrol Street Cleaning in New York. A new experiment being tried by the superintendent of the fourth street cleaning district in Manhattan. 300 words. Municipal Journal, December 21. 10 cts.

Snow Removal:

Snow Removal on Trunk Line Highways. State supervision required; continuous service demanded and long hours requisite; use of road machinery for snow removal. By Chas. I. Bennett, state highway commissioner of Connecticut. 3 ills., 1,900 words. Municipal and County Engineering, December. 25 cts.

New Jersey Plans for Keeping Roads Clear of Snow. Snow removal to be done by the counties, not by the state. A plan decided upon by the representatives of the Highways Transport Committee of the N. J. State Council of Defense, engineers and supervisors. 1 ill., 300 words. Municipal Journal, December 28. 10 cts.

Organization, Methods and Equipment Employed in Removing Snow from Main Roads in Pennsylvania. Use of road machinery and motor trucks with plow attachments; attention to drainage; development of snow removal in Pennsylvania. 4 ills., 2,100 words. Municipal and County Engineering, December. 25 cts.

Snow Fences for Highways. Used to prevent drifts on highways in the state of Pennsylvania. From a paper by Geo. H. Biles, second deputy state highway commissioner of Pennsylvania. 400 words. Municipal Journal, December 21. 10 cts.

Snow Removal from Trunk Line Highways. Pennsylvania methods of keeping the main roads open in winter. 2,300 words. Engineering and Contracting, December 4. 15 cts.

Sand Spreading Device of San Francisco Street Cleaning Department. For alleviating the slippery condition of streets in wet weather; sand spreader is attached to Elgin street sweeper. By C. W. Geiger. 1 ill., 500 words. Engineering and Contracting, December 4. 15 cts.

Refuse Disposal:

Pittsburgh Garbage Disposal Report. Recent information concerning methods at Baltimore, Chicago, Cincinnati, Cleveland, Kansas City, Milwaukee, Minneapolis, New York, Philadelphia, St. Louis, St. Paul and Washington; methods recommended for Pittsburgh. 1 table, 3,500 words. Municipal Journal, December 14. 10 cts.

Pittsburgh Garbage Disposal Report. Recommendations of committee that department of public works collect garbage and rubbish; incineration of rubbish and reduction of garbage. 1,600 words. Municipal Journal, December 21. 10 cts.

Waste Products of Cities and the War. Need of waste products for fertilizers; methods of disposal of sewage, street sweepings, trade wastes, dead animals, and garbage; incineration; reduction; feeding to swine; effects of war. By W. T. Knowlton, engineer of sewers, Los Angeles, Cal. 4,500 words. Municipal Journal, December 28. 10 cts.

Organization for Waste Reclamation. Organization of councils in various cities and towns for salvaging waste materials. 1,300 words. Municipal Journal, December 21. 10 cts.

CITY PLANNING.

City Planning. Editorial discussion of the article by James W. Routh and Frank P. Cartwright in this issue. 600 words. Municipal Journal, December 7. 10 cts.

Set-Back Lines. Power to establish them from a legal standpoint; opinions of legal authorities and courts. By Wm. J. Locke, secretary, California League of Municipalities, from "Pacific Municipalities." 1,600 words. Municipal Journal, Dec. 21. 10 cts.

City Plan Commission. Their organization and effectiveness; opinions from ten cities analyzed and compared; organization adopted by Rochester, N. Y. By James W. Routh, Rochester Bureau of Municipal Research, and Frank P. Cartwright, ass't engineer. 2,000 words. Municipal Journal, December 7. 10 cts.

Land Development, Transportation and Housing. Letter to the editor from A. G. Dalzell, consulting engineer, Vancouver, on the important connection between the method of developing the land —including the method of planning and constructing the streets—and the building operations and housing schemes. 1,200 words. Canadian Engineer, December 26. 15 cts.

Housing Problems and Their Relations to the After-War Construction Program. Betterment of housing conditions essential to reduce ill health and conserve human energy and manpower. By Mark C. Cohn, director of housing, California State Immigration and Housing Commission. 1,700 words. Pacific Municipalities, December. 30 cts.

The Community House—An Element in Reconstruction. How chambers of commerce can promote sane progress and honor their townsmen who have served in the war, by raising funds for "Liberty Buildings" as soldiers' memorials. By Samuel Wilson, manager, Chamber of Commerce, Kansas City, Kan. 3,000 words. American City, December. 35 cts.

Labor Turnover Reduced and Financial Savings Effected by Better Housing. Important economic and engineering problems discussed at meeting of National Housing Ass'n. 1,000 words. Engineering News-Record, December 12. 20 cts.

Government and Finance:

Progress, Prospects and Pitfalls of the New Profession of City Manager. The Lockport bill; prospects of commission manager form; obstacles in the way of the new profession. By O. E. Carr, city manager, Springfield, O. 2,500 words. Canadian Engineer, December 12. 15 cts.

Combining Democracy with Efficiency in City Government. Trained executive should be charged with the business details, but the general policy should be decided by a council representing all the citizens as near as possible. By Walter J. Millard, field-secretary for the American Proportional Representation League. Pacific Municipalities, December. 30 cts.

Collective Public Service Operation. As proposed for the four towns on the south shore of the St. Lawrence river, opposite Montreal. By Roger DeL. French, consulting engineer. 900 words. Canadian Engineer, December 19. 15 cts.

War-Time Problems of the Utilities Commission. Illinois commission during recent period confronted with necessity to speed rate cases and with other serious problems. 1,400 words. Electrical World, December 7. 15 cts.

How Will Our Cities Pay for Future Improvement and Public Services? Brief resume of the practice of the leading cities of the U. S. in levying special assessments for municipal improvements and public services. 4,700 words. American City, December. 35 cts.

MISCELLANEOUS.

Industrial Outlook:

Building Industries Conference at Ottawa. Nearly 200 general contractors, sub-contractors and representatives of supply firms form active new national organization to be known as the "Association of Canadian Building and Construction Industries"; national reconstruction problems discussed and large amount of ground covered in busy three-day conference. 9 ills., 9,000 words. Canadian Engineer, December 5. 15 cts.

Reconstruction Minister, Discussing National Problems, Prophesies Considerable Industrial Activity. Hon. A. K. MacLean, chairman of the reconstruction committee of the Dominion Cabinet, addressed the members of the Association of the Canadian Building and Construction Industries at their Chateau Laurier, Ottawa. 1,400 words. Canadian Engineer, December 5. 15 cts.

War Emergency and Reconstruction Congress. Remarkable convention of American business men held at Atlantic City; able addresses and practical, farseeing platform; government ownership of railroads, wires and other utilities opposed. 2 ills., 5,700 words. Electrical Review, December 14. 30 cts.

Reconstruction Outlook in the Industry. Views of officials of companies in the industry and the opportunities in wise solution of the problems affecting cost and service to the consumer. 1 ill., 2,000 words. Electrical World, December 14. 15 cts.

Hasten Plans for Public Works. Editorial comment on the advisability of providing employment on public works for returning soldiers and released war workers. 600 words. Municipal Journal, December 21. 10 cts.

Hasten Improvements—But Plan Them Now. Adequate consideration necessary for large projects. 500 words. Municipal Journal, December 14. 10 cts.

1919 A Happy New Year. Editorial comment on the bright prospects of prosperity for the cities and the need of confidence of those in charge of city affairs. Plan at once for public works that will put money in circulation and give employment to those released from

(*Continued on page 122*)

NEWS OF THE SOCIETIES

Feb. 25-28, 1919.—AMERICAN ROAD BUILDERS' ASSOCIATION. Sixteenth annual convention and Ninth American Good Roads Congress under the auspices of the A. R. B. A., Hotel McAlpin, New York, N. Y. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

Nov. 12-14, 1919.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

American Water Works Association. The nominating committee of the American Water Works Association has presented the following names as candidates for offices for 1919-1920: President, Carleton E. Davis, Philadelphia, Pa.; vice-president, M. L. Worrell, Meridian, Miss; treasurer, James M. Caird, Troy, N. Y.; trustees, W. H. Randall, Toronto, Ont. (District No. 1), and F. C. Jordan, Indianapolis, Ind. (District No. 4).

American Society of Civil Engineers. At the annual meeting of the American Society of Civil Engineers a number of resolutions were passed and reports accepted.

President A. N. Talbot reviewed the activities of the society for the past year, and referred to the vital part played by engineers in the war. A total of 1,593 members, ranging from major generals and rear admirals down through the ranks, had entered the service. He mentioned the work of the American Engineering Standards Committee, and developed in detail many suggestive proposals for the future work of the society.

The Committee on Award of Prizes reported the following awards: The Norman Medal to L. R. Jorgensen for his paper, "Multiple-Arch Dams in Rush Creek, California"; the James R. Croes Medal to Israel V. Werbin for his paper, "Tunnel Work on Sections 8, 9, 10 and 11, Broadway-Lexington Avenue Subway, New York City"; the Thomas Fitch Rowland prize to F. W. Scheidenhelm for his paper, "The Reconstruction of the Stony River Dam"; the James Laurie prize to Charles W. Staniford for his paper, "Unusual Cofferdam for 1,000-Foot Pier, New York City," and the Collingwood prize for juniors to James B. Hays for his paper, "Designing an Earth Dam Having a Gravel Foundation With the Results Obtained in Tests on a Model."

Three new committees were organized during the year: (1) The Committee on Development, consisting of one member, appointed by each of the twenty-two local associations, and seven members at large, appointed by the president; (2) the New York Meetings Committee, with authority to arrange for the second meeting in each month; (3) a committee of the Board of Direction, appointed to keep it informed of any governmental or other programs looking to reconstruction or rehabilitation of the engineering resources of the country after the war.

The Nominating Committee for the coming year was elected as follows: District 1, J. J. Yates; District 3, F. P. Williams; District 5, J. F. Conway; District 6, N. F. Sprague; District 10, F. E. Weymouth; District 11, W. Fay Barnard, and District 13, H. L. Haehl.

The Special Committee on Engineering Education reported that after twelve years of work its final report was ready in the form of Dr. Mann's exhaustive studies, undertaken with the aid of the Carnegie Foundation. After sketching the history of technical education Desmond FitzGerald moved that the president appoint a committee of three to confer with the committee of other societies to insure careful and general discussion of Dr. Mann's report.

The preliminary report of the Committee on Development was accepted without discussion as a progress report.

A resolution was passed condemning the recent dismissal of about 350 engineers employed by the Public Service Commission for the First District of New York. Another resolution urged the carrying on of public works.

Marshall O. Leighton discussed the work of the National Service Committee, recently organized in Washington. An office has been established in the McLoughlin Building, Washington, and the work is now being financed by the residue of the appropriation made to the Engineering Council last year.

The election of officers was announced as follows:

President, Fayette Samuel Curtis, Boston; vice-presidents, to serve two years, Herbert Samuel Crocker, Denver, and Leonard Metcalf, Boston; for treasurer, to serve one year, Arthur Smith Tuttle, New York City; for directors, to serve three years, George Hallett Clark, New York City; Jacob Stinman Langthorn, New York City; Charles Clement Elwell, New Haven, Conn.; Willard Beahan, Cleveland; John Watson Alvord, Chicago, and Carl Ewald Grunsky, San Francisco.

At the afternoon meeting Brig.-Gen. R. C. Marshall, Jr., chief of the Construction Division, U. S. A., described in detail the work done in this country during the war.

National Highways Association—Division of Bridges. Declaring itself in favor of placing bridges under the same jurisdiction as roads with regard to construction and to maintenance the organizing meeting of the Division of Bridges, National Highways Association, held on January 17 at New York, formulated plans for an active campaign in developing the national interest in highway bridges. Most important of the problems are those arising in the case of bridges over large rivers. At the motion of the chairman, Gustav

(*Continued on page 122*)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Pittsburg, Cal., has retained the consulting engineers, Olmsted & Gillelen, to prepare plans for a WATERWORKS SYSTEM.

Pitman, N. J., is to make PAVING IMPROVEMENTS according to plans prepared by the consulting engineering firm of Remington & Vosbury.

Parksville, Pa., contemplates making PAVING IMPROVEMENTS to cost $130,000, according to plans prepared by the consulting engineers, Stoneham & Butts.

Brookings, S. D., is planning to make PAVING IMPROVEMENTS, involving laying of pavements and storm sewers, according to plans prepared by the consulting engineer, L. P. Wolff.

Anderson county, Garnett, Kans., is to build a BRIDGE of reinforced concrete with three 60-foot spans and 18-foot roadway. The consulting engineer is H. A. Noble.

The commissioners of Macon county, Oglethorpe, Ga., have advertised for bids for a REINFORCED CONCRETE BRIDGE over the Flint river. Plans were prepared by the consulting engineers, Garrett & Slack.

Oshkosh, Wis., is having plans prepared by the Scherzer Rolling Lift Bridge Co. for a BRIDGE over Fix River.

PAVING IMPROVEMENTS are contemplated by the city of Grafton, N. D., according to plans being prepared by the consulting engineering firm of Charles L. Pillsbury Co.

Findlay, Ill., has had plans drawn for the construction of a SEWERAGE SYSTEM. The consulting engineers are Miller, Holbrook & Warren.

A BRIDGE is to be built by Hummelstown, Pa., plans for which have been prepared by the consulting engineer, Clinton M. Hershey.

A GRAVITY SEWERAGE SYSTEM is to be built in spring by the city of Auburn, Me., according to plans prepared by the consulting engineer, H. K. Barrows.

Bids have been advertised for by the commissioners of the Thompson Drainage and Levee district, Fulton county, Lewiston, Ill., for extensive DRAINAGE and LEVEE WORK. The consulting engineers are Goodell & Fulton.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

PORTABLE PUMPING APPARATUS.

"Seco" Equipment for Cleaning Catch-basins, etc.

This is an appliance the chief purpose of which is to clean catch-basins and similar receptacles of dirt and filth; but it can be connected into a motor truck with water-tight dump body; can be used for spraying trees, for irrigation pumping, and other purposes, and for sprinkling and flushing streets. It can also be used as a heavy-duty dump truck for handling coal, coke, ashes or heavy building material. No cranes or hoists are used in changing it from one of these purposes to another.

The chassis carries a covered tank, and in the front of this a pump with various hose connections. The tank is supplied with a hose for removing the overflow and for filling the tank with water from a fire hydrant. Immediately behind the driver and securely attached to the back of the seat are placed all the operating levers. There is a space under the tank for storing the covers when it is not desired to use them. There are no parts projecting beyond the wheels of the vehicle, except as the hose may be drawn out temporarily during catch-basin cleaning.

To clean a catch-basin, the pump discharges water from the tank into the catch-basin to soften up the dirt, and the mixture of dirt and water is removed and discharged into the tank by the suction created by water pumped from the tank through a foot piece in the basin. The dirt settles in the tank and the water is used over and over again. As dirt accumulates, the surplus water escapes through the overflow hose into the gutter. The dirt from the basin does not pass through the pump, which therefore is not choked or worn by it. The dirt accumulating in the tank is dumped where desired by a mechanically operated dumping hoist.

The pump can be used for spraying trees, the tank holding the spraying solution. Or the covers can be removed from the tank, the pump disconnected, and the apparatus used as a watertight dumping truck for collecting garbage or other materials containing water. In order that it may be used for sprinkling or flushing, the manufacturers furnish attachments for this purpose, controlled by levers within reach of the driver.

This equipment, which is shown in the accompanying illustration, is manufactured by the Springfield Engineering Company.

PORTABLE PUMPING EQUIPMENT CLEANING CATCH-BASIN.

INDUSTRIAL NEWS

The Steel Situation.

Recent orders received by the steel mills show a slight improvement, but the gain is small in point of tonnage and the total of new buying is frankly admitted to be quite insufficient to carry the mills at their present rate of operation for various periods, and in capacity. The shipments are chiefly against old orders.

The steel being bought is generally for repair work and for the manufacture of ordinary goods. There is little steel being bought that would be used for construction work—bridges, buildings, factories, etc.

The opinion expressed by a majority of the steel producers in Pittsburgh is that there will be no further declines in prices for some time, probably until April 1. In some quarters the attempt is made to argue that there will be no further declines, but that rather the public will eventually become accustomed to paying present prices, the prediction being qualified by the statement that it assumes there will be no wage reductions.

Possibly April 1 is set as the date before which further declines in iron and steel prices will not occur on account of its representing the date to which the War Industries Board would have set prices if it had decided to continue fixing them. Now there is a desire to see if the trade cannot acquire the habit of voluntarily making its price changes on the quarterly dates, pursuing the course that was followed during government fixing.

While steel producers are watching the situation keenly for possible breaks in prices, the common view is that there will be none during the present order of things, for the reason that there is no incentive or temptation to cut prices. Buyers evince no interest in late deliveries, irrespective of price. What little buying is occurring is for very prompt delivery, the delivery rather than the price being the item of interest to buyers.

National Federation of Construction Industries.

At the first meeting of the officers and directors of the permanent organization of the National Federation of Construction Industries, held at the Blackstone Hotel, Chicago, January 15 and 16, the following executive committee was elected: B. F. Affleck, F. T. Miller, A. M. Maddock, J. T. Duryea and J. R. Wiggins.

In pursuance of a resolution providing for a Special Conference Committee on Publicity to confer with the "Own Your Own Home" Committee of the National Association of Real Estate Boards and with the Division of Public Works and Construction Development of the United States Department of Labor the chair appointed the following: Louis Bruch and B. S. Smith, Chicago; L. A. Putnam, New Orleans; W. T. Rossiter and E. A. Roberts, Cleveland.

The formation of a Committee on Industrial Conditions was referred to the Executive Board.

The following Export Committee was appointed: J. T. Duryea, chairman; J. A. Kling, B. F. Affleck, J. L. Kaul.

The following committees were established, with chairmen as agreed upon, the further personnel to be selected later: Finance operations, F. T. Miller; transportation, W. D. Dickey; commercial arbitration, O. K. Foster; business ethics and practice, L. McNamara; conservation, B. F. Affleck; legislation, J. L. Kaul; cost accounting, J. A. Kling; legislation, J. R. Wiggins.

NEWS OF THE SOCIETIES

(*Continued from page* 120)

Lindenthal, of New York, the division declared itself prepared to co-operate in the study of problems of large river crossings on the request of local authorities.

The division, headed by Mr. Lindenthal, is composed of Adm. H. H. Rousseau, Washington; Professor George F. Swain, Boston; Frank C. Osborn, Cleveland; C. A. Wilson, Cincinnati; Edwin Duryea, San Francisco; R. D. McCarter, New York; Professor E. J. McCaustland, University of Missouri; Professor Donald Derickson, Tulane University; F. E. Schmitt, New York, and Charles Evan Fowler, New York, secretary. On invitation Professor Arthur H. Blanchard, Columbia University, joined the division to represent the general highway aspects of the subject more directly.

General discussion of the situation and requirements of the highway network of the country with respect to crossings of large rivers, especially interstate streams, brought to attention a very extensive neglect of adequate provision for communication at such points. The Missouri River has a length of 350 miles in the state of Missouri, but only three highway crossings, one at each end of the stretch and one near the middle; the Hudson River has not a single highway crossing in 150 miles from its mouth to Albany; the Ohio River is still more poorly equipped with road bridges; the Mississippi River is without a road crossing below Memphis. It was the sense of the meeting that the most important responsibilities resting on the division lay in stimulating and giving assistance to efforts toward the construction of additional lines of communication across the large rivers. In view of the fact that far more railway crossings exist than highway crossings, and that in building a railway bridge it is usually practicable at small additional cost to provide for a highway also, it was proposed to assist all efforts to secure highway accommodation on new railway bridges. At the present time various burdensome laws are obstacles in the way of such provisions, and the division will, where requested, use its endeavor to promote remedial legislation by which this difficulty may be overcome.

While the division's work will lie essentially in a field not now covered by the activities of state highway departments, the meeting recorded itself in favor of full co-operation with the state departments in the view that fullest success in dealing with highway bridge problems can only be secured through the harmonious joint efforts of all concerned. Co-operation with national port authorities was also considered with favor in so far as a bridge may be a necessary co-ordinating element in a large port.

New England Water Works Association.

The February meeting of the New England Water Works Association will be held at the Hotel Brunswick, Copley Square, Boston, Mass., on Wednesday, Feb. 12.

Following a meeting of the executive committee at headquarters, lunch will be served at the hotel at 1.00 p. m. At 2.00 p. m. will take place the formal presentation of the Dexter Brackett memorial medal for the year 1917.

The following papers will be presented: "Some Practical Uses of Rainfall Records" (illustrated), by L. M. Hastings, city engineer, Cambridge, Mass.; "Measurement of Rainfall," by Robert E. Horton, hydraulic engineer, Albany, N. Y.

Florida Engineering Society.

The Florida Engineering Society recently held it annual meeting at Jacksonville. In presenting the report of the committee on harbor improvements, W. W. Fineren, United States junior engineer, United States Engineer's Office, Jacksonville, emphasized the need of municipalities taking a more active interest in developing the harbor facilities of Florida, and indicated many possibilities for expansion. In the report of the president of the society emphasis was given to the lack of recognition for engineering service, including a statement that although engineers, by training and experience, are fitted for civic duties, they have in the past been seldom appointed to civic boards and commissions.

The following officers were elected: President, B. Johnson, Miami; vice-president, G. B. Hills, Jacksonville, and secretary, J. R. Benton, Gainesville.

MUNICIPAL INDEX

(*Continued from page* 119)

war work. 400 words. Municipal Journal, December 28. 10 cts.

Construction:

Pneumatic Method of Concrete. Adapted for heavy, difficult concrete work; plant consists of a mixer, a pipe conveying system and a compressed air plant. 2 ills., 2,400 words. Engineering and Cement World, December 1. 15 cts.

Compressing Concrete Increases Its Strength. Plain columns of successive layers pressed down averages half again as strong as those poured for full length. By Frank P. McKibben, professor of civil engineering, Lehigh University, Bethlehem, Pa. 3 ills., 1,600 words. Engineering News-Record, December 5. 20 cts.

Supreme Court Fixes Responsibility of Contracts. Contractor not answerable for consequences of defects in plans and specifications; Spearin case decided. 1,300 words. Engineering News-Record, December 26. 20 cts.

Twin Peaks Tunnel Completed in San Francisco. One of the most expensive and spectacular engineering feats of this year; constructed by the Municipal Railway Company. 3 ills., 1,400 words. Engineering and Cement World, December 1. 15 cts.

General:

Engineering Societies to Have Employment Bureau. Decision of the engineering council; replying to letter on reconstruction commission, President Wilson favors existing machinery. 1,000 words. Electrical World, December 7. 15 cts.

Problems Before the Civil Engineers' Society. 3 alternative plans of organization and their logical results are discussed; more representative form inevitable. By Gardner S. Williams, Ann Arbor, Mich. 1,600 words. Engineering News-Record, December 5. 20 cts.

National Association of Contractors. Met in Chicago, Nov. 20-21, and completed organization efforts begun at Atlantic City last July; constitution adopted and officers elected. 2,600 words. Engineering and Cement World, December 1. 15 cts.

Engineering Educators Convene at Boston. Welcome to British mission and discussion of the lessons of the war for technical instructors features of meeting; broader training for engineers and necessity for greater thoroughness in professional preparation urged. 2,900 words. Electrical World, December 14. 15 cts.

Engineering Education Affected by War Expenience. Dr. C. R. Mann discusses future due to war training; effects upon academic standards. 2,000 words. Engineering News-Record, December 12. 20 cts.

Federal Investigations for the Public Welfare. Investigations in all branches of science should be carried on continuously by experts retained by the Government for that purpose. Great possibilities in united action for the general good. 900 words. Municipal Journal, December 28. 10 cts.

The Relation Between Civil and Military Engineering. Fundamentals are the same; same strategy, different tactics. By Major-General Wm. M. Black, chief of engineers, U. S. Engineering Department. 2,800 words. Canadian Engineer, December 26. 15 cts.

Practical Measures for Securing Greatest Economy in Public Utility Plant Operation. Proper use of recording and indicating instruments; small plant conditions; the bonus system; some examples of plant neglect. By Chas. Brossman, consulting engineer U. S. Fuel Administration on Utility Plants in Indiana. 2,000 words. Municipal and County Engineering, December. 25 cts.

Just Values and Fair Rates Needed. Investment bankers point out requirements of utility situation; Mr. Taft says outlook is not good. 1,000 words. Electric Railway Journal, December 14. 15 cts.

Design of Concrete Truss Bridges. Discussion of theoretical and practical points resulting from designs proposed for bridges on the Toronto-Hamilton highway; method of computing stresses in arched chord; expansion plates; splice of lower and arched chords. By Frank Barber, consulting engineer, Toronto. 1,200 words. Canadian Engineer, December 26. 15 cts.

St. John River Affords Big Opportunities. For development of the natural resources of the maritime provinces; reclamation of waste land by drainage; utilization of water powers; site proposed for new tideless harbor. By Frank S. Small, B.Sc. 3 ills., 7,000 words. Canadian Engineer, December 5. 15 cts.

Developing Irrigated Land with Selected Settlers. In California experiment, real estate sharks have been eliminated and expert agencies called in to help sales problems. 3 ills., 4,300 words. Engineering News-Record, December 5. 20 cts.

Methods and Cost of Maintenance of a twenty-seven and a half acre Park System. Two tables—labor cost of maintaining park system, and water used for sprinkling. By H. R. Ferriss. 1,400 words. Engineering and Contracting, December 4. 15 cts.

Municipal Journal

Volume XLVI NEW YORK, FEBRUARY 15, 1919 No. 7

SEWAGE SCREENING PLANT IN NEW YORK CITY

Completion of the First Unit of the General Plan of the Metropolitan Sewerage Commission—Grit Chambers, Screens, Apparatus for Handling Screenings and Other Details of Dyckman Street Plant.

The first step in the actual carrying out of the plans of the Metropolitan Sewerage Commission for the reduction of the pollution of the waters around New York City has been realized by the completion of a plant for the fine screening of sewage, which plant is located at the foot of Dyckman street, New York. This plant was completed in October, 1918, and has been turned over to the city quite recently. Following its completion, a thirty-day operation test was conducted by the contractor and the results of this test are reported to have been entirely satisfactory. At present the plant is being operated one shift of 8 hours a day.

This plant is used to screen the sewage from an area of 300 acres before discharging it into the Hudson river, the removal of grit in a sedimentation chamber, fine screening, and dispersion of the effluent through multiple outlets being the only treatment given the sewage. The area from which this sewage is collected contains about 200 people to the acre over half of it, while the other half is changing rapidly from a condition of scattered development to that of a closely built-up section of high-class apartment houses.

SERVICE BRIDGE, HOUSINGS OF SCREEN BEARINGS, AND ELECTRIC MOTOR.

The plant is located near the outlet of a combined sewer which was already in service. The dry-weather flow is diverted from this sewer to the plant, passing through an intercepting sewer to a grit chamber which is built in duplicate, from which it passes to influent chambers leading to the screens, of which there are two. From the screens the sewage enters a deep well and from this flows through an outlet pipe to a point about 100 feet off shore, where it is discharged into the river.

From gaugings of the dry-weather flow that were made in the combined sewer near the outlet, it was found that the total daily flow was about two million gallons, two-thirds of which ordinarily passed through the sewer in eight hours. The maximum rate of flow occurred between 8 and 10 A. M. on Mondays, at which time it was about three to four cubic feet per second. During periods of storms, considerable quantities of grit and sand are brought down from the hills through the sewer, the topography in this section running to steep grades and deep, narrow valleys. The sewage is comparatively fresh, although somewhat comminuted and fairly dilute.

The filtering plant was designed to have a capacity of ten million gallons per day, which would accommodate not only the present maximum dry-weather flow but also storm water to the extent of twice the amount of the domestic sewage. Storm water in excess of this is discharged into the river through the original sewer outlet.

In order to intercept the dry-weather flow and divert it to the filter, a cut-off or diverting dam 15 inches high was built in the invert of the existing sewer at a point about 1,000 feet in shore from the plant, this height of dam being sufficient to furnish the head necessary to carry ten million gallons a day through a three-foot circular conduit lined with vitrified segmental blocks to the grit chamber and through the screens. Storm water which passes over this diverting dam is carried through the old sewer, and from the original outlet of such sewer an extension of rectangular cross-section has been built to the river side of the plant, where the storm water is discharged at an elevation of 4.5 feet below mean high water.

After passing through the circular conduit, the dry weather flow is turned into either the north or south grit chamber by means of stop planks operated from the

surface. These grit chambers are constructed just outside of the filter building and are two in number, each of reinforced concrete fifteen feet long, four feet wide and nine feet deep. In each chamber are removable baffle boards that run longitudinal and are set in a fashion similar to the trough leaves of the Imhoff tank and are placed in the chambers by means of adjustable pins and strap saddles. These baffle boards serve to prevent the escaping of gases and to obtain the liquefaction of putrescible matter that may collect in the tanks.

The chambers are roofed over with removable reinforced concrete slabs faced with irons, set in Z iron frame seats and provided with two-inch lifting rings. Each cover is two feet three inches long and fifteen inches wide and can be handled by one man. If it should prove desirable, ordinary inclined bar screens are to be set at both the outlet end and inlet end of the chamber, arranged to slide in two-inch grooves.

The grit is removed from these chambers by automatic eductors which are operated by means of water-main pressure, and discharge, when in operation, through a pipe carried across the top of the storm sewer to the south embankment, where the outlet end of the pipe is below normal tide level. The eductor syphon is of five-inch manganese bronze pipe of strength sufficient to work under a pressure of 125 pounds per square inch. While the eductor is in operation, the grit in the chamber is agitated by water brought from the water mains under pressure and discharged through a one-inch standard nozzle. The eductors have a capacity of ten cubic yards per hour when operating under a water pressure of 35 pounds per square inch, and are designed to insure smoothness of discharge without using an excessive amount of water. An overflow by-pass leads from the grit chambers to the storm sewer, to become operative in case the screens should be submerged by the blocking of the effluent line.

The influent chambers leading from the grit chambers to the screens are provided with main sluice gates rectangular in shape and 36 inches high by 48 inches long of the rising stem type and operated by geared pedestals. They are capable of working against a sewage pressure of twenty pounds per square inch on either side of the gate without leakage. The gate frame and guides as well as the double-ribbed gate itself are of cast iron, and all fittings are bronze-mounted. Backwater guides are provided to prevent chattering of the gates. The lifting shaft is of cold rolled steel. The operating stand is fitted with ball and roller bearings for taking the thrust when the gate is opened or closed. Another sluice gate of similar pattern 24 inches square is set at the head of the effluent line to the drop-well to control the discharge.

The screens are housed in a building rectangular in shape with a flat roof. It is 65 feet deep, 30 feet wide and rises about 20 feet above the level of the street surface. The outside walls of the superstructure are finished with dark red face brick and trimmed with molded artificial stone. The roof is of reinforced concrete, supported on steel I beams and covered with pitch and felt roofing. Two large roof skylights of the louvered type are located directly over the screen pits, and a number of wide pivoted windows just below the roof give additional light and provide ventilation. Removable copper wire fly screens of reversible pattern cover the windows and ventilators. This building and the filtration plant are built on a rock ledge at the low water mark of the river about 100 feet from the outlet of the old sewer.

VIEW OF SCREEN HOUSE AND RIVER BEYOND.

The plant is reached from the street by a roadway paved with granite blocks. A coal storage pocket is built outside the building, between the grit chambers and the storm sewer and immediately adjacent to the boiler room, being connected to this room by a vertical sliding door.

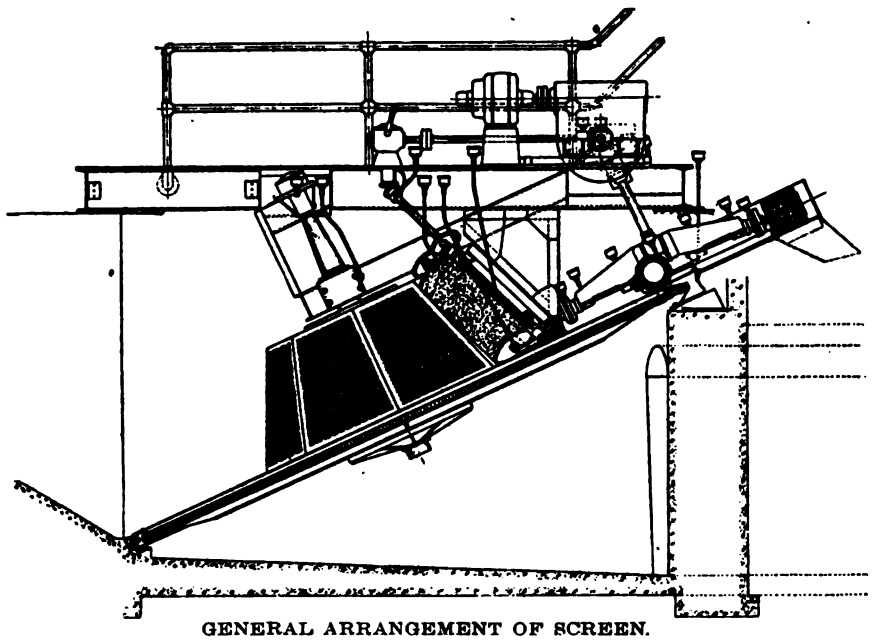
There are two screens of the Riensch-Wurl type, 14 feet in diameter and inclined 20° to the horizontal. They are of the overhung type and are set about 15 inches above mean high tide. The rated capacity, based on a sewage containing 300 parts per million of total suspended solids, is 7.75 cubic feet per second at maximum screen submergence, which is about 0.8 of the screen area. (This type of screen was described in Municipal Journal for August 5th, 1915.) The plates of the screen disc are of manganese bronze, fastened to the frame of the screen by flat-head countersunk screws. The perforations in the plates on both the disc and the cone are 3/64 of an inch wide and 2 inches long, set about ¼ of an inch apart and staggered. Each opening is of countersunk cross-section with the narrow end of the opening in the upper face of the screen and the long axis parallel to the line of travel of the brushes that sweep the screenings off of the screen. It is expected that about ¾ of a foot of hydraulic head will be lost in passing sewage through the screen at maximum submergence. The upper main screen shaft bearing is of combined radial and thrust type, while the other bearings are of the journal type. All are mounted in cast iron housings equipped with glands and packing rings and operate in oil or grease fed from cups and pipes set on or under the service bridges.

The service bridges are located on the operating floor at about the elevation of street level and directly over the screens. They are constructed of steel framing and are covered with perforated steel floor plates. Over all bearings and gears, the floor plates are built in trap-door sections. Iron pipe guard railings are provided on each side of each service bridge.

Each screen is driven by a separate and independent electric motor drive, connected to the reduction gear by an automatic centrifugal safety clutch coupling. The motor for operating each screen and brush mechanism is located on the bridge and is of 4 H. P. capacity and of variable speed type. The screen motor controls are provided with an automatic starter so as to protect against poor voltage conditions. A panel type speed regulator, with self-contained non-inductive resistance outfit is installed to give 50% reduction in the normal speed of the motor. The motors are stopped or started by push-button control, one set being located on the panel and another on the bridge near the brush drive. The power lines are carried from the cable ducts in the street to a transformer behind the panel, from there to the switchboard, and then to the electric drive.

The screenings removed from the screen by the brushes are swept into a trough of galvanized iron plate, from which they drop into cans. These cans are carried on a

turntable located directly beneath the hopper of each screen. Each turntable holds three cans each of about one-third cubic yard capacity. It is constructed of steel



GENERAL ARRANGEMENT OF SCREEN.
Screenings brushed off into cans that are set at the right of the partition wall.

and revolves on roller bearings and is operated by hand by gear wheels, the operator working from the lower floor level. The turntables are built as open as possible to allow for thorough flushing and washing.

The cans for holding the screenings are constructed of heavy galvanized iron, and are water-tight and, when covered, are air-tight. A brass pet-cock is set near the bottom of the can for draining off the surplus liquid. The cans are provided with handles for lifting and dumping. For handling the cans, an electric hoist is provided which is carried by a hand-geared carriage guide, the carriage being of the four-wheeled type running on the bottom flange of a ten-inch I beam which is suspended by steel collars hung from the roof beams. The ten-inch I beam is arranged to swing in extension form through either doorway so that the cans may be run out over the river and deposited in boats or over the roadway and deposited in carts. The hoist is operated by 1½ h. p. electric motor geared to a hoisting speed of 30 feet per minute. The transformer is single speed and is operated from the operating floor. There is a one-ton hook directly beneath the carriage for lifting the cans with the necessary chains, etc., and a half-ton hook at a distance from the carriage for dumping the screenings.

At present the screenings are carried away by carts of the Street Cleaning Department, about six or seven cans of screenings being removed each day of eight hours' operation.

A 22-inch sectional rectangular water boiler, set on the lower level near the east wall, provides means of furnishing hot water for cleaning the screens, and a steam boiler of the same size generates steam for general heating of the building and for spraying the screens with live steam. A small hot-water storage tank also is provided. Hot and cold water pipes and steam pipes, hung on short brackets, lead to an office, lavatory, shower room and points situated conveniently for cleaning the screens. About 30 feet of hose is provided at each of several hot and cold water outlets for flushing the screen house floors. The pipes used for spraying the screen terminate in special slotted sections and either steam or hot water can be discharged through them, pet cocks near the point of discharge making it possible to shut off the spray from various parts of the slotted area. The water used in flushing and washing can be charged with a disinfectant by means of a dosing tank provided with a simple dosing mixer and ball valve which is placed on a platform above the operating floor.

After passing through the screen, the sewage drops into a deep well, from which it will flow through a 12-inch cast iron flexible-joint pipe laid in the river bed to a point about 100 feet off shore and in water where the depth is 40 feet below mean high water. Multiple outlets at the end of this line provide for diffusion into the river. (This effluent pipe has not yet been laid).

In one corner of the operating floor is an office about 10 x 12 feet, and adjoining this, but separated by a partition, are two shower baths equipped with hot and cold water, a lavatory, lockers and wash room. The contract price for the entire plant was $75,000, $60,000 of which was for the two screens.

STREET CLEANING METHODS.*

Machine Sweeping—Where and When Used to Advantage—Construction of Sweeper—Operation in Batteries—Cost.

MACHINE SWEEPING.

Machine sweeping is a necessary part of the street cleaning work. It is especially advantageous in Rochester on block pavements in good repair and in a few cases on brick and asphalt streets where the dirt is very heavy. It is really effective only on pavements in good condition and is best done in conjunction with patrol hand sweeping. If the streets are swept too frequently with machine brooms the cost increases beyond a reasonable figure; on the other hand, two or three sweepings a week are not enough for very dirty streets. Machine sweeping is effective in sweeping up quantities of wet leaves. Machine sweeping is done in some sections of Rochester only when shortage of labor makes it necessary, and in emergencies of this kind has saved the day.

Traffic makes machine sweeping in the down-town section impracticable in the day-time, because of delays and the necessity of driving around standing vehicles, and such sweeping should be done at night.

Rochester uses ten machine brooms, six with 8' 8" brooms and four with 10' 8" brooms. The effective stroke of a broom is from 12 to 18 inches less than the full length. Seven machines sprinkle ahead of the broom through perforated iron pipes. These do not extend the full length of the longer brooms, the perforations clog easily, and the water is not supplied in sufficient quantity or far enough ahead of the broom to be effective. A much better plan would be to abandon the use of the sprinkler pipes and use a sprinkling cart in connection wtih a battery of machine sweepers, the cart traveling far enough in advance of the sweepers to give the dust time to absorb the water before being swept up.

Manufacturers of brooms give the following as the relative lengths of service of different kinds of material:

*Continued from page 104.

DUST RISING FROM SWEEPER.
Sprinkler pipe is two feet shorter than broom.

Relative Wearing Qualities and Cost of Brooms.

Broom	Length of Service in 8-hour days	Cost of Refilling 1917 Quotation
Rattan	18 to 22	$16.00
African bass	24 to 36	20.00
Split hickory	8 to 10	12.00
Split bamboo	8 to 10	12.00
China reed	10 to 12	15.00

The broom spools are pitch filled, with split bamboo, in Rochester at a cost of $13 for either size. The life of these brooms is about six eight-hour days on rough Medina pavements, and from ten to twelve days on other pavements, which makes the average cost of broom wear about $1.50 a day. Under present conditions, this cost is not unreasonable.

Machine brooms will not do effective work when worn down to less than four inches. They should be changed end for end after every three days of service to make them wear evenly. When worn down to six inches, the counter balance should be removed to obtain better pressure.

It costs two or three times as much per unit area to sweep with one broom as to use two brooms together, and three-broom batteries are economical under some conditions.

A well-balanced gang of able-bodied men for machine broom sweeping would consist of:

	Daily wages
1 foreman @ $70 a month.....	$2.80
4 broomers and pilers @ 28 cts. per hour..	8.96
2 machine brooms with teams and drivers @ $5 per day	10.00
1 pick-up team with a man to drive and load	5.00
1 loader to help driver.....	2.24
1 sprinkler and driver in dry weather.....	5.00
Total wages per day.....	$34.00

Such a gang should be able to sweep 180,000 square yards or more of pavement a day.

The practice of machine sweeping on very rough Medina block and stone pavements might well be discontinued as a waste of time and money. In the first place, the machine brooms not only do not reach into the depressions in the pavements, but they fill them up with dirt as they go along and thereby greatly increase the labor of the piling gangs which follow. Secondly, many of the Medina streets are so rough that most traffic avoids them entirely. The cheapest and best way to clean these streets is to flush them once or twice a week with hose.

Occasionally machine sweeping is done on macadam streets, and results inevitably in removing the binder and damaging the surface. This practice should be discontinued.

From observations of the work and a study of modern methods and results, the following practice and procedure are suggested:

In general, two-machine batteries should be used. This has proven most economical locally and should tend to reduce the present high unit costs. Occasional machine sweeping should be followed up by a piling and pick-up gang and augmented by patrol sweepers. Sprinkling from 10 to 20 minutes ahead of the machines will prevent them from raising clouds of dust, and it will produce better results because of the softening of the street dirt. Sweeping should be done during light rains and after heavy ones so as to obviate, whenever possible, the need for sprinkling. The area to be swept should be sprinkled just enough to keep down the dust.

Machine sweeping should be done consistently in the vicinity of coal yards and cellar excavation work and at points where a number of mud streets connect with a hard pavement, because quantities of material are dropped from loaded wagons or strewn along the paved streets for blocks by the wagon wheels. In such cases it is practically impossible for a patrol sweeper to keep pace with the dirt deposited; the machine sweeper is best adapted to this kind of work.

Sprinkling cart drivers should be given definite instructions and required to go through certain routine work. After hitching up, the driver should partly fill the tank at the stable and try out the spray heads, to be sure they are in good working order before leaving the barn. He should make sure that the axles are well greased. Horses

STONE BLOCK STREET BEFORE SWEEPING.

SAME PLACE FIVE MINUTES LATER.
Sweeper works dirt into depressions. Comparatively small amount swept into gutter.

should be watered every hour, while the tank is being filled. The following equipment should be on the cart: A bucket for watering horses, a regular hydrant wrench, a wheel handle for special valves, a filled oil can, and a red lantern filled and cleaned for night work. The sprinkling cart should start out in advance of the sweeping machine and proceed directly to the starting point. Hydrants should be flushed out before the tank is filled, and they should be opened and closed with care. Burlap spray shields should be used on leaky hydrants and hose to protect pedestrians.

Sprinkling should begin at the center of the street and continue not more than two long or four short blocks before turning around, unless the entire width can be sprinkled in one trip, as is frequently the case. The route should be sprinkled in the same direction the machines are to follow. The tank should be filled as often as is necessary, but care should be taken to avoid use of excessive quantities of water. In many cases where the dust is light it will be unnecessary to keep the nozzles open continuously. In such cases alternate wet and dry places 20 to 30 feet long should be left. Cross walks should not be sprinkled.

The machine sweeper drivers also should be required to follow a definite routine. Before leaving the stable, all moving parts of the machine should be oiled and greased. The following equipment should be supplied on the machine: A monkey wrench, a filled oil can, a red lantern filled and cleaned for night use, a regular hydrant wrench, a wheel handle for special hydrant valves, and a bucket for watering horses. Before going out of the barn, the broom levers should be tested to see if the machine is operating properly. The broom should be thoroughly wet before the work is started, to make the fibres flexible. When the fibres are worn down to four inches or less, a new broom should be put on the machine.

When ready to begin work, the first machine should start sweeping a strip to the right of the center of the street, with the broom adjusted so as to sweep to the right. The second machines should follow close behind the first machine and in a position to sweep the strip to the right of the first machine and so as to lap the stroke of the machine preceding by about six inches. (This will make it necessary for the near horse of the second machine to walk on the windrow made by the first machine.) In no case should the last machine sweep closer than 18 inches to the curb.

The machines should continue not over two long or four short blocks, which have previously been sprinkled, before turning and sweeping the other side of the street. This will allow the sweeping gang following to bunch and pile the dirt on both sides at the same time, and so complete a section in a reasonable time. The work should be continued until the schedule of streets is complete. Drivers of vehicles standing along the routes should be requested to move out of the way. If they refuse, no time should be wasted in arguments. Vehicles should not be moved without the authority of the owners.

(To be continued)

INCREASING MUNICIPAL REVENUE

Why Higher Per Capita Revenues Are Necessary—Methods Employed by the Larger Cities of the Country for Increasing Revenue—Delinquent Taxes—Exemptions—License Taxes on Various Kinds of Business

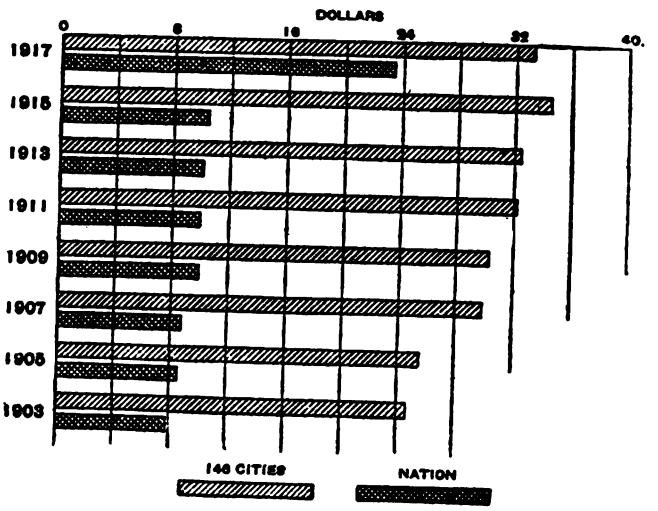
The adoption by the required number of states of the prohibition amendment to the constitution has given emphasis and immediate importance to a condition which has been developing in municipal affairs for a number of years past. During 1917 (the latest year for which reports are available) the revenues secured from liquor taxes or licenses by the 219 cities having 30,000 population or more amounted to about $37,000,000. The total receipts from taxes by these cities for the same year was $742,000,000. It appears therefore that the liquor licenses amounted to a little less than 5 per cent of the total receipts from taxes of all kinds. There are quite a number of cities, however, which derived a much larger percentage of their revenue from their liquor licenses. For instance, Perth Amboy, N. J., and Peoria, Ill., derived 15 per cent of their income from this source, West Hoboken, N. J., 16 per cent, East St. Louis, Ill., 21 per cent, and Joliet, Ill., 23 per cent; while there were a considerable number which derived 10 per cent or more from such licenses.

When the income of a city from a certain source is reduced, there are generally only two alternatives, either decreasing expenses or increasing income from some other source. While the 5 per cent average losses to these largest cities seems a small amount, still it means either a reduction in the budget for all time to come or an increase in the taxes collected in other ways.

REDUCING MUNICIPAL EXPENSES.

Before planning for an increase in taxation, wisdom demands that it be ascertained first whether expenses cannot be cut down to meet the decreased income. The average "governmental cost payments" ("The governmental costs of a municipality for a given fiscal year are its expenses, interest, outlays, and expense ledger adjustments for that year") during the thirteen years from 1903 to 1915 inclusive have increased from $24.60 per capita to $34.53, the increase being continuous although not uniform.* (There was a slight decrease between 1915 and 1917 owing to the economies due to the war.) In addition to these payments, we find that the net indebtedness of the cities increased during the same period from $44.71 per capita to $77.86, or about 75%. ("By net in-

*All the figures used in this article are based upon the report of the U. S. Census Bureau for the year 1917, embracing all cities of over 30,000 population.



PER CAPITA NET GOVERNMENTAL COST.
Payments of the cities having 30,000 population or over, and of the nation.

debtedness is meant the total debt obligations outstanding, less the resources available or provided for their immediate or ultimate redemption. It is obtained by deducting the assets of the general sinking fund from the sum of the funded and floating debts.") While the population of these cities increased during this period 38.2%, their net indebtedness increased 140.7%. In the great majority of cases this indebtdness was occasioned by the issuing of bonds for permanent improvements, but in some cases the proceeds of the bonds have been used for cost payments.

The cause for this increase in per capita cost of operating our cities is not difficult to discover. It is not at all necessary to attribute it to increasing extravagance, nor would this be correct, for we believe that in general the affairs of American municipalities are being conducted each year with increasing efficiency and economy. The chief cause is undoubtedly the increasing number and extent of activities which the city is called upon to conduct for the benefit of its citizens. The following is quoted from a report prepared by the State Bureau of Municipal Information of the New York State Conference of Mayors and Other Officials, which report we shall have occasion to refer to several times in this article. Concerning this matter of "expanding functions" this report says:

Functions of government, and particularly those of city government, become more numerous, complex and costly as population increases. These functions are made necessary as primitive methods, involving individual effort, no longer serve the purpose. As a community grows, a municipal water system must supplant wells and cisterns; a sewerage system must take the place of out-houses and cesspools. The wastes of the community such as ashes, garbage, street litter, sewage and rubbish must be collected and disposed of by community instead of by individual efforts. One by one services which were ordinarily performed by the householder when the community was smaller must be surrendered to the city as it grows.

Higher standards of living, a better understanding of the causes of disease and crime and a keener appreciation of the value of preventive work, have created a public demand within recent years for municipal activities that were not known or considered a decade or two ago. Municipal hospitals, clinics, dispensaries, playgrounds and other recreational facilities are today municipal necessities, and not fads as they were regarded at one time. These necessarily increase the tax burden, although they decrease the cost of service to the community as a whole and add to the comfort and enjoyment of the inhabitants.

Other additions to the expense are caused by substituting paid for volunteer fire departments, constructing plants for purifying the water supply, providing more brilliant street illumination, more expensive pavements for carrying the heavier and more abundant vehicular traffic, more thorough cleaning of such pavements, and numerous other improvements in municipal utility constructions and housekeeping. None of these things can be considered as luxuries, and most of them are absolutely essential to the effective and economical conduct of the activities of a modern municipality. These are sufficient to account for a large part if not the whole of the great increase in the cost of operating our cities. And it does not seem probable that the limit has been reached or even approached. If our cities are to grow in size and usefulness, these municipal functions must be expanded in scope and increase in number, and the per capita costs must continue to increase.

Among other causes for increased cost of conducting city governments are an increase in the rate of interest on bonds issued for municipal purposes, higher cost of living demanding higher wages for municipal employes, while in some cities woman's suffrage adds to the cost of elections by practically doubling the number of voters, and in some the workmen's compensation law applies to city employes and adds somewhat to the total expenses.

During the past fifteen years the increase in per capita cost has averaged about 3% a year, and it seems probable that a continuation of this increase may be expected in the future.

It has been suggested and in fact asserted many times that the revenue lost to the cities by abolishing the liquor traffic will be more than made up in the reduction of municipal expenses made possible by decreasing the size of the police department, the numbers of reformatories and hospitals, etc. Taking the totals for all of the cities reported, in round numbers only, we find that the total expense of police departments for the year 1917 was $69,000,000, for poor institutions $5,900,000, for insane institutions and hospitals $16,400,000 and for correctional institutions for adults $6,000,000. This gives a total of $97,300,000. The loss of revenue from the adoptions of prohibition is $37,000,000, or about 40% of the total expenses of the police departments and the institutions which might be claimed to owe part of their necessity to liquor. It hardly seems probable that even the maximum amount of benefit which can be conservatively estimated as accruing from the operation of the prohibition amendment would so far reduce the demands on these several municipal functions as to permit reducing the appropriations for them by this amount.

INCREASING INCOME.

There would therefore appear to be no possibility of meeting the condition referred to by reducing expenses unless we wish to take a backward step in the many things which to us have come to mean modern civilization. In looking for some plan of increasing revenue, the first tendency is to cast about for some new source, or to consider which of the present sources can increase its contribution to the revenue with the least disarrangement of business conditions or which will arouse the least storm of protest from the victims. As suggested editorially last week, it is worth considering whether the present sources of income are being drawn upon not only to the limit allowed by law, but even with justice to all concerned by securing the collection of all taxes due under existing tax laws. Leniency and delay in collection of taxes is a benefit to neither the city nor the tax-payer except in those indefensible cases in which the tax-payer is able to evade payment altogether. The collection of delinquent taxes should make a collector more popular with all citizens except those who have endeavored to evade payment, and these are or certainly should be greatly in the minority. It would therefore seem as though failure to make every effort provided by law for collecting all taxes must be due largely to pure laziness on the part of the collector. Be that as it may, we believe that many cities could more than make up for the loss in liquor taxes by enforcing payment of taxes already assessed.

Another suggestion is to reduce the tax exemptions on real property. The tax committee of the New York Conference of Mayors has advocated that real properties of fraternal and benevolent organizations, private sanitariums and hospitals other than free and public hospitals, church property other than the buildings used for worship and religious instruction, and private schools which charge for instruction, be placed on the assessment roll and required to bear their share of the expense of state and local governments. It was stated that there were private schools charging a tuition which owned $51,000,000 worth of property in the state on which no taxes were paid. The total amount of property in that state exempted from taxes was, according to the latest figures, $636,000,000.

The exempting of church, hospital and similar property from taxation may be considered in the light of a contribution by the people to these benevolent organizations

and purposes, and if the people intentionally and knowingly release the holders of this property from taxation for this purpose there is certainly no reason why objection should be entered. There is some question, however, whether the taxpayers generally understand just what this exemption means to them. For instance, it is estimated that if the exempted property in New York State were taxed for state purposes on the same basis as other property, it would contribute one-third of the entire expenses of the state; in other words, if this property were not exempted each tax-payer in the state would have one-third less tax to pay. Certainly a more businesslike and more open way of making public contribution to these objects of benevolence would be to collect taxes from them for all real estate which they may hold, and to make contribution through the municipal or state officials of such sums as it may be desired to contribute to each of them. One desirable result of this, it is anticipated, would be to remove the opportunity (now taken advantage of in many cases) for unworthy organizations to secure the advantages of these exemptions through subterfuge or favoritism.

Other methods suggested are the semi-annual collection of taxes, thus saving interest paid on temporary loans issued in anticipation of taxes and diminishing tax delinquencies by permitting property owners who are unable to pay the whole tax to pay at least half and go in arrearage for the other half. Some cities do not collect any of their taxes in advance but borrow money to pay running expenses until the tax is collected, the interest on which loans must, of course, be added to increase the tax levy.

The common plan in most cities for increasing taxes, because the easiest, has been in the past to increase the tax on real estate. For instance, during the fourteen years from 1903 to 1917, the per capita tax collected from real estate has increased from $12.98 to $20.57, while during the same period the liquor taxes have decreased from $1.32 to $1.16 per capita. The result of this has been inevitably an increase in rent and in the cost of carrying on every kind of business, since all of these directly or indirectly pay the land taxes. In the opinion of a great many, the time has come when real estate can no longer bear so large a share of the burden of increasing taxes. Moreover, since increased taxes on real estate are added in their entirety, if not even with an increment, to the rentals paid by the laboring classes, there seems to be justice in the demands that methods be found for raising additional taxes such that they cannot be unloaded so directly onto those least able to afford to pay them.

Conditions in this respect are by no means the same in all cities, since some raise a much larger percentage of their total income from real estate taxes than do others. Of all of the cities included in the census report, the average percentage of total revenue receipts that come from real estate was 63.9. One city, however, reports as high as 88% derived from this source, and several others exceed 80%; while, on the other hand, one city reports as low as 34.5% and quite a number are below 50%. In the case of the first cities, there would seem to be abundant opportunity for raising additional revenue without increasing the taxes on real estate, while in the case of the cities now raising less than 50% of their revenue in this way it would seem that real estate could stand the burden of the necessary increase.

When inspection is made of the practices of the various cities to discover new sources of income, other than taxing real estate, we find these bewildering in number and variety. The Census Bureau classifies the various revenue receipts as those obtained by taxes on property, poll taxes, and business and non-business licenses; special assessments and special charges for outlays; fines, forfeits and escheats; subventions, grants, gifts, donations and pension assessments; earnings of general departments; highway privileges, rates and interests; and earnings of public service enterprises. As already stated, the majority of cities obtain more than 50% of their income from taxes on property. Only a small part of the income of any city is derived from poll tax, less than half of the cities deriving any income from this.

Business and non-business licenses are the source of considerable income in most cities, this running as high as 15 or 20% of the total in some cases. It is in this class that is found the greatest variety of sources of revenue. For instance, the first city listed in the report, Birmingham, Ala., lists about 350 different kinds of business that are licensed, from which it obtains 19.1% of its total revenue. Other Alabama cities are not far behind it in the number and variety of licensed businesses. Most of the rates in Birmingham are not high, but the aggregate amounts to nearly $390,000 a year. Dog licenses are collected by most cities and the total amount so collected in the cities of the report was $661,909, of which Chicago collected $113,610.

Taxes collected with issue of license other than on liquor traffic totaled almost ten million dollars, every city of over thirty thousand population obtaining some income in this way. Taxes collected without issue of license, which totaled $6,534,834 for the cities reported by the census, were as follows:

In Birmingham, Ala., one-half of one per cent is levied on the gross premiums collected by fire insurance companies.

California collects taxes on gross earnings of public service corporations in lieu of all other taxes and turns over to the cities on demand an amount equal to what each city would have collected from such corporations located within such cities, to cover payment of bonded indebtedness incurred prior to 1910 and interest thereon.

The kinds of business taxes collected in Washington, D. C., together with the rates at which they are levied are as follows: Insurance companies, except mutual fire insurance companies, are assessed one and one-half per cent on premiums; building and loan associations, two per cent on gross earnings; incorporated savings banks, electric light companies, telephone companies, and street railway companies, four per cent on gross earnings; barge and dock companies and gas light companies, five per cent on gross earnings; National banks and trust companies, six per cent on gross earnings; market companies, four per cent on earnings from conduits.

In Georgia a tax on gross premiums received by insurance companies is collected in three cities. The rates are one per cent in Atlanta, one and one-half per cent in Augusta one and one-fourth per cent in Macon. In Macon wholesale dealers in gasoline pay a tax of one-half of one per cent on amount of sales.

In Illinois a tax for the benefit of the fire department of the city is levied on foreign fire insurance companies to the amount of two per cent of premiums collected within the city by their agents.

In Kansas, foreign fire insurance companies pay to the State two per cent on the gross premiums collected in each city and this tax, less three per cent, is paid to the firemen's associations in the cities where collected.

Maine collects business taxes on telegraph, telephone and railroad companies and pays therefrom to each city or town in the State an amount equal to one per cent of the capital stock of such companies held by residents of that municipality, the total so paid not exceeding the amount collected. The tax imposed on telegraph or telephone companies varies according to the amount of gross annual receipts collected within the State from one and one-quarter to six per cent of such receipts. The tax imposed on each railroad for each unit of railroad operated within the State is a percentage of the average gross transportation receipts per mile of the entire system both within or without the State, the percentage varying according to the amount of such average receipts per mile from one-quarter of one per cent to four per cent for a

street railroad company and from one-half of one per cent to five and one-half per cent for any other railroad company.

In Minnesota the State in each city collects on the gross premiums of foreign fire insurance companies a tax of two per cent, which is paid into the firemen's relief fund of the city in which collected.

A tax of five per cent in St. Paul is levied on the gross earnings of trust companies and of public service corporations other than street railways.

In Minneapolis there is levied a tax of one-fourth of one mill on each bushel of wheat and flaxseed and one-eighth of one mill per bushel on all other grain received or handled in elevators.

St. Louis taxes merchants and manufacturers at a rate of $1 on every $1,000 of sale, and street railway companies one mill for each passenger carried during the year.

Montana collects a tax of two per cent on premiums of fire insurance companies. One-half of the amount collected in Butte is paid into the city treasury for the benefit of the firemen's disability fund.

In Lincoln, Neb., the following business taxes, based on the gross receipts, are collected without issues of license: Electric light and power companies, two per cent; express companies, two and one-half per cent; gas companies, two and one-half per cent; street railway companies, five per cent; telegraph companies, two per cent; telephone companies, two per cent.

All cities in New Jersey collect a tax of two per cent on the gross earnings of fire insurance companies, and the receipts from this source are distributed equally between the firemen's pension fund and the firemen's relief associations in the cities where collected. According to an act of the Legislature cities are empowered to levy a tax of five per cent on the gross receipts of auto buses.

In North Carolina, fire insurance companies, except such as invest three-fourths of their capital in the State or in State securities, pay to the State a tax of one-half of one per cent on the gross premiums collected. The State pays to the treasurer of each city having an organized fire department and complying with certain requirements the amount of such taxes collected in that city for the benefit of the local firemen's fund.

In Oklahoma a tax of two per cent on the gross premiums of foreign fire insurance companies is collected by the State and one-half of the receipts in each city is paid to the local fireman's pension fund.

In all Rhode Island cities auction sales are taxed one-tenth of one per cent of the proceeds and eighty-seven and five-tenths per cent of this amount is remitted direct to the State by auctioneers conducting the sales and the balance is paid into the city treasury.

Each city in South Carolina receives through the State a tax of one per cent on the gross premiums collected by fire insurance companies licensed to do business within the State. Insurance companies not so licensed can place insurance in the State only through licensed insurance brokers. A tax of four per cent is imposed on the premiums which are collected. One-half of the amount of such collections in each city is returned by the State through the city where collected for the equal benefit of city corporation and the firemen's insurance and inspection fund.

Dallas, Texas, collects a four per cent tax on gross earnings of detective agencies.

Wheeling collects a two per cent tax on gross premiums of foreign fire insurance companies.

All cities in Wisconsin collect without issue of license certain business taxes levied at rates prescribed by statute as follows: Taxes on net income ranging from one to six per cent, of which seventy per cent is retained by the city, ten per cent is paid to the State and twenty per cent is paid to the county in which collected, special provision being made in the case of proprietors of grain elevators or warehouses. The tax on the gross earnings of telephone companies varies from two and one-half to five per cent; the city retains eighty-five per cent of the tax and the State receiving the remainder. Casualty insurance companies are taxed two and one-half per cent of their gross premiums; fire and marine insurance companies, two and three-fourths per cent of their gross premiums; and life insurance companies three per cent of their gross income from all sources.

General license taxes are collected on bicycles, motor cycles, automobiles, drivers of motor vehicles, horse-drawn vehicles, garages, motor trucks, weapons, social clubs, push carts and floats. Special property taxes are assessed by certain cities on savings bank deposits, mortgages, inheritances, steamboats, street railways, corporations, horses and mules, insurance companies, gas and electric companies. For instance, in New Hampshire savings banks pay one per cent per annum on special deposits or capital stock after deducting the value of all real estate. In Ohio there is a collateral inheritance tax of 5 per cent, half of which is paid to the city, village or township in which it originates.

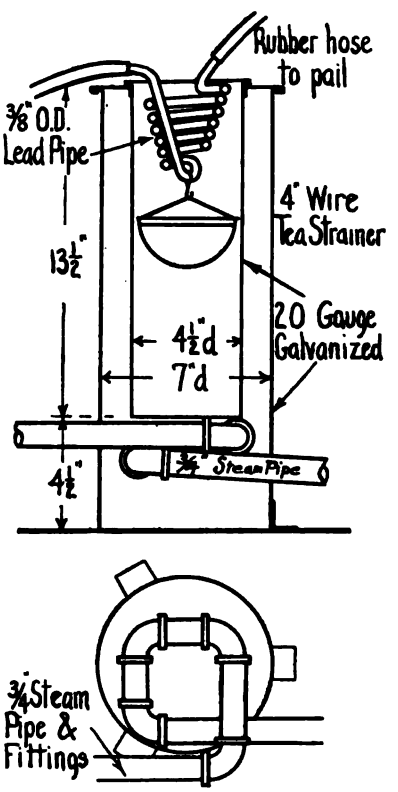
When all is said, however, there remains the fact that all of these special methods of raising revenue, numerous and ingenious as they are in many cases, bring in only about 9 per cent of all the money raised by taxation of any kind in the cities reported, and further combing of the field would probably bring to light possibilities that would not even approximate, in the amount which could be realized therefrom, those that would seem to exist in a more thorough and effective collection of the property taxes already provided for.

Most cities reimburse themselves for certain expenditures made for public improvements and a few public services rendered, by assessments made against the property benefited. This plan of meeting the problem will be discussed in a future issue.

STEAM HEATED BITUMEN EXTRACTOR.

By C. H. LOVEJOY.

Portable asphalt plants are not located in one place long enough to have electricity installed about the premises. The extractor shown in the sketch was made at slight expense and gave satisfactory results in making analyses of asphalt pavement samples, even in cold weather and in a rough shanty.



STEAM HEATED BITUMEN EXTRACTOR.

A small amount of live steam blows through the coil and furnishes enough heat to evaporate the carbon disulphide in the reservoir. This condenses on the lead pipe coil and drops back through the sample in the tea

strainer. Cold water should be passed through this coil just fast enough to produce rapid drops, without running a stream. This means about two pailfuls in five hours.

Weigh 200 grams of sheet asphalt or topeka mix, or 400 grams of a coarser mixture on a chaslyn balance. Three 5" filter papers are overlapped to cover the inside of the tea strainer, and the sample placed therein. Put 250 c.c. of carbon disulphide in the reservoir, and hang the sample from the lead coil.

After 5 hours extracting the sample should be clean and the bitumen with the disulphide at the bottom of the reservoir. Pour this into a porcelain evaporating dish and burn to ash. Add the ash to the sample and weigh. Calculate the bitumen as the loss in weight between this and the original weight of sample taken. The usual screen test is then carried out with this mineral aggregate.

The general principle of this extractor is not new, but the writer, being compelled last year to make tests where electricity was not available, made up this extractor from odds and ends around the asphalt plant. Even used outdoors in freezing weather it worked more rapidly than the electric heated extractor.

MAKING WATER ANALYSES.

Reasons Why Analyses Are Desirable, Chemical, Bacteriological and Physical—Private or Municipal Laboratories—Suggestions for Taking Samples and Analyzing.

It is extremely desirable that regular examinations be made of the water as supplied to the consumers in every city, and in the majority of cases that additional examinations be made of the water at one or more points before being finally delivered into the distribution mains. There are three general arguments in favor of this—first, that it is necessary for learning promptly any changes that may be taking place in the raw water as it reaches the reservoir or plant, and taking immediately such precautions as may be necessary; second, that it is necessary for learning the efficiency of any treatment which the water undergoes, whether it be merely sedimentation in a reservoir or that by the most elaborate purification plant, and remedying lapses or defects in such treatment; third, that definite figures and facts may be available with which to answer complaints of citizens as to the quality of the water, and for compiling a record of the operation of the plant.

An analysis of the water as it reaches the reservoir or in the reservoir itself is generally desirable in order to learn of the initial development in the reservoir of algae or plankton growths generally, in order that an immediate treatment may stop any further development; to detect the presence in water coming from various parts of the catchment area of organic matters in solution or suspension that might serve as food for a development of algae; and also to detect the presence in any tributary stream of contamination by sewage or other polluting matters. Also an occasional analysis of the water at different depths of a reservoir informs a superintendent as to the extent to which the lower strata are becoming polluted, and can be interpreted to give warning of impending turnovers and indicate the proper time for drawing off the foul bottom water and the amount of such water that it is desirable to remove in case this method of treatment is practised.

Where the water is treated by rapid sand filtration, in which chemicals are always used for purposes of coagulation, the amount of chemical necessary will vary with certain mineral contents of the water, and if the variations in such contents are not known, either there will be from time to time an insufficient amount used with resulting diminution in the efficiency of the plant, or at other times there will be an unnecessarily large amount of chemicals used with resulting increased costs and possibly creation of objectionable taste or odor in the water. The most important feature, however, is the possibility, which is by no means negligible, that the treatment will not secure the degree of bacterial purification necessary to insure against the delivering of pathogenic bacteria to the consumers; also the possibility that water will contain hardness, sulphur or other matters in solution or suspension that will make it objectionable for use in boilers or in industries in which water plays an important part.

Analyses taken of the water as delivered have enabled many a superintendent to retain the confidence and good will of consumers who have experienced objectionable tastes or odors in the water as drawn from their faucets, and whose complaints might otherwise have been met at the office by non-committal replies or promises to "do something about it," which promises the superintendent, ignorant of exact conditions, might have been unable to keep. If a record is taken daily, or at intervals of only a few days, of the various physical characteristics of the water, both as it enters the distribution system and as it is drawn from the faucets at one or more points in that system, such data will generally enable him either to convince the citizen that his complaint is not justified, or to inform himself concerning the causes of the objectionable conditions.

In this connection it is well to remember that there frequently occur local conditions which cause local complaint, probably the most common being the creation of suspended matter in the water by the stirring up of sediment which had collected in the mains, such stirring up being occasioned by a fire or other use of a fire hydrant, a broken main, or any other cause of considerable change in velocity or direction of flow in one or more sections of the distribution system. The superintendent, knowing from his records that, on the day concerning which complaint of muddy water was made, the water entering the mains was clear, will naturally inspect the records of the outdoor gang to learn whether some such occurrence in the neighborhood of the complainant was not accountable.

Analyses that should be made of the water include bacteriological, chemical and physical, the first chiefly to determine the probability of the presence of pathogenic bacteria; the chemical, for determining the presence of sewage pollution, hardness or other mineral constituents that make the water objectionable for use (such as iron, sulphuric acid, etc.), of carbon dioxide, of alum, free chlorine or other matters resulting from the use of chemicals in purifying water; and physical for determining turbidity, color, odor, taste and temperature; also microscopic examinations, chiefly in connection with investigation of plankton.

The frequency with which such examinations should me made vary with the kind of examination, the season of the year, the frequency and rapidity of variation in the character water, etc. Where a supply is from deep wells the character of the water is not subject to rapid changes, and fewer examinations will be necessary than when it is from surface supplies or even shallow wells. Where the water is known to be polluted, it should of course be treated; but the fact that it is being treated should not cause it to be taken for granted that the treatment is necessarily and continuously effective. Any plant or method of treatment is subject to unanticipated

and unrealized lapses from full efficiency, no matter how careful or intelligent the operation; and sufficient analyses of the water and of the chemicals applied should be made to furnish frequent assurances that the operation of the plant maintains an acceptable degree of efficiency. It should be realized that a defective filter may at any time pass water containing bacteria which may cause scores of deaths from typhoid.

Chemical analyses generally need not be taken so frequently as bacteriological, chiefly because the chemical composition of the water does not ordinarily change suddenly, except where such sudden changes are made regularly at certain hours of the day or certain days of the week or month. Daily analyses made during the first few weeks or months of operation will generally give sufficient information concerning such periodic variations. The penalty for ignorance concerning chemical changes that occur in the water is not nearly so serious as that caused by a sudden but unknown increase in the pathogenic bacteria content.

In the case of physical examinations, also, it is not ordinarily necessary to make these with great frequency, except such examinations as may be necessary for controlling the treatment of the water or for keeping a daily record of the efficiency of such treatment. Physical examination, and especially microscopical examination, of reservoir water, is desirable at greater frequency during the season when algae are to be expected (as indicated by previous experience) than during other seasons of the year. By knowing the exact day when it is best to apply copper sulphate to a reservoir, such treatment can be made much more effective and trouble from tastes and odors due to algae may be largely anticipated and prevented.

Making water analyses, and especially the bacterial analyses, requires considerable experience if they are to be reliable. At the same time, many of the more generally useful ones can be made by any superintendent of reasonable intelligence after a little instruction and experience. As described in Municipal Journal for June 28, 1917, the Georgia State Board of Health encourages all waterworks superintendents to make the more important analyses themselves. If samples are shipped to a laboratory outside of the city, there is necessarily considerable delay in obtaining results, and in addition the water may undergo some change in condition during transit. If the analysis can be made by the superintendent himself as soon as collected, it permits a direct and immediate control of the purification treatment or other operating features of the plant. Of course certain physical tests, such as that of temperature, can be made only at the point of collection. Most state boards of health will examine samples of water sent to them from cities within the state, and unless the cities can maintain a competent professional chemist and bacteriologist, such examinations should be made at regular intervals, say four times a year, for the purpose of checking the tests made by the superintendent.

But sole reliance should not be placed in these occasional tests, and even small plants should maintain a laboratory for making the more important tests. It is possible to secure good equipment for routine water bacteriology, such as bacterial counts and tests for B. coli, for about $125. The cost of chemicals and bacteriological media is quite small after the laboratory is once started. An incubator, sterilizer and similar equipment can be obtained that operates by either electricity, gas or gasoline, the first being generally most convenient and safe. The Georgia Board of Health finds by experience that the average superintendent can learn easily the necessary bacteriological technique for making routine control tests after a few days' training under an experienced worker. He should provide himself with one or two books on water bacteriology and chemical and physical analyses, and a copy of the "Standard Methods for the Analysis of Water," 1917 edition, of the American Public Health Association.* While of course he will probably make some errors at first, after a few weeks of experience it should not be difficult for him to obtain results that, at the very least, will be far better than having no certain and definite information whatever of the kind that they are calculated to furnish.

The ability of someone connected with the plant to make tests of this kind will frequently prove advantageous in unexpected ways. For instance, in 1917 the head of the Hartford, Conn., laboratory was called upon to answer a complaint of a large department store that the water from their taps was so hard that it could not be used in their hair-dressing department. He found the water to have about three times as much hardness as that of the city supply, showing positively that it was not pure city water, and an investigation revealed that there was being mixed with it a deep-well private supply that was used by the store for its sprinkler system. In the same city the fire department claimed that the water was corroding the brass fixtures on the fire hose; but the chemist knew that there was no acid in the city water and investigation revealed that sulphur was absorbed from a certain make of fire hose by water that stood in it when stretched out on rack supports and that this sulphur was responsible for the corrosion.

In addition to analyzing water, the chemist should also be prepared to analyze hypochlorite, lime and other chemicals that may be used in treating the water. In addition, if the water department or company is engaged in any construction work, the chemist frequently tests cement and other materials used in such work.

The chemist might also analyze and test the coal and oils used in the pumping plant. By arrangement with the local board of health or health officer he could also make analysis of drugs and foods, including milk, and make other tests and examinations for the various city departments as needed; for which services the laboratory should receive compensation from the city that would help to cover the cost of its operation.

In several of the larger cities there are to be found private laboratories that make a specialty of water analyses, and in such cities it would generally be satisfactory and cheaper to employ these private laboratories for making the analyses. Except, however, that where a filtration plant or other purification plant of considerable size is operated, there is generally sufficient analytical work to keep at least one chemist and bacteriologist busy; also, such plant is frequently at a considerable distance from any private laboratory; for which reason more prompt and reliable results from analyses are obtainable, and ordinarily at less cost, if they are made in a laboratory located at the plant and by a chemist or bacteriologist employed for this purpose.

---

*The American Public Health Association several years ago adopted, after discussion by the leading experts of the country, a set of "Standard Methods for the Analysis of Water." These were revised in 1914 and again in 1917. These methods have been followed for years by the majority of chemists and bacteriologists who make analysis of water supplies, and it is recommended that waterworks superintendents secure a copy of the publication describing these methods and follow these in their analytical work. They are published by the association at $1.25 a volume, bound in water-proof cloth.

(To be continued.)

Municipal Journal

Published weekly at
243 West 39th Street, New York, N. Y.
by
Municipal Journal and Engineer, Inc.

S. W. HUME, *President*
J. T. MORRIS, *Treasurer* A. PRESCOTT FOLWELL, *Secretary*

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago

Contributed Articles and Reports

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

WORK AS A COAGULANT.

Water rendered muddy by a long and violent storm will clear itself in time if freed from all agitation; but the time may be long—in fact some colloidal matters may never settle out. The time may be greatly shortened and a greater purity obtained by applying a coagulant. This of course increases the immediate cost, but is most economical if all costs are taken into account, to say nothing of satisfactoriness to the consumers. The muddying of the water may even prove advantageous in that the suspended matters, in settling, carry down with them a large percentage of the disease germs present. If we filter the water we remove a much larger percentage of the disease germs, but for muddy water, previous sedimentation is very desirable.

The entire world has experienced the most violent and protracted storm of history, and the social and industrial life of every nation has been stirred to the depths, is still in a very unsettled condition and needs clarifying greatly before peace and safety can be enjoyed again. The weightier matters have settled, or are being settled at Paris; but the waters are still muddy and will clear very slowly if the clarification be not assisted by the application to all parts of some coagulant. For a coagulant the experts recommend work as the most promising. The "idle rich" have fallen into foolish and vicious ways, not so much because they are rich as because they are idle. The idle poor also fall into foolish and vicious ways, different in their nature but even more serious because of the greater number of individuals in the class. Given sufficient work and the waters would clear rapidly and the national life resume its peaceful and healthy development. The immediate cost of supplying the work may be greater than if matters be left to adjust themselves, but in the end such action would make for economy, even though the cost of applying the remedy now be unusually high.

It is not only the unsettled condition of life and the business world that needs attention. The germs of disease have grown abundantly and threaten a most serious epidemic of Bolshevism, I. W. W.-ism and other plagues. By applying the coagulant of work we may remove the greater part of this danger, only a few of the most virulent specimens not responding to this remedy. Such specimens are being removed by the filtering process of the Department of Justice. More than fifty are awaiting deportation today at Ellis Island and it is reported that more than seven thousand have been entangled in the schmutzdecke and will be given similar treatment. But the work of removing these virulent germs will be greatly simplified by first clarifying the water.

The above is not a mere play upon words; it is the sober—very sober—truth. Hundreds of thousands of men are reported to be without work in all sections of the country except the South. Agitators, mostly of foreign origin, are taking advantage of conditions to carry on a propaganda that is avowedly aimed at the very life of the country. If this is to be suppressed, every effort must be made to remove reasons of discontent, and the most potent of those reasons is enforced idleness.

If every man of an idle half-million be paid $3 a day for even useless work, the cost would be less than half a billion dollars a year—an enormous sum, but insignificant compared to the loss this country would suffer if conditions here should even approximate those in Russia, the model of the Bolsheviki. But such work need not be useless. Every city has public work that needs to be done. Even though some money could be saved by waiting for lower prices, money is also being lost through the need of new pumping machinery, repairs to streets, and full efficiency in other public utilities. Moreover, we owe it to our returned soldiers that they suffer no uneasiness as to their future, but that work be provided for them at once. And above all we owe it to our country, to ourselves who are the country, to clear the troubled waters and aid in suppressing the agitation that threatens serious consequences. In this work the cities have a most important duty to perform. And America expects every city to do its duty.

SEWAGE TREATMENT IN NEW YORK.

Every city has some sewage disposal difficulty peculiar to itself, but few are confronted with a more serious one than Manhattan borough of New York. Three million people on a small island, every foot of which is held at enormous valuation and most of which is already built upon, contribute an enormous amount of sewage the only outlet for which is into rivers and a bay already grossly polluted. To obtain land sufficient for even the most compact of modern sewage treatment plants is out of the question without going off the island. One difficulty of locating such a plant in one of the other boroughs is illustrated by the garbage reduction plant on Staten Island (Richmond borough of New York), the construction of which was fought continuously in the courts and which, now that it is constructed, has been prevented from operating, at least temporarily. No borough will, without a fight, permit any of its area to be used for the disposal of sewage from another borough.

If it can not take the sewage off the island for treatment and cannot use private land on the island for that purpose, there appears to remain only public lands—the parks and streets. And, the use of the surface of these being out of the question, the possibility of sub-surface plants is being studied. One such plant has been built, as is described in this issue, and is being tried out by operation during the eight hours of strongest sewage each day.

One of the most serious difficulties with a screening plant, we anticipate, will be disposing of the screenings. The total amount of screenings and grit from the combined sewage of three million people would be appalling in its volume. The disposing of this on the island would seem to be impracticable, and possibly the only solution will be dumping them far at sea. The efforts at solving New York's problem will be watched with interest by sewage engineers the world over.

The WEEK'S NEWS

Proposed New Federal Aid Road Plans—Indiana's New Highway Program—Reduction of Veneral Disease in the Army—England's National Health Ministry—Pennsylvania Towns Refuse to Pay for Water—Omaha Cuts Water Rates—Secretary Lane Proposes Big Power Development Plan—New Jersey Police and Firemen Urge Pension Legislation—San Francisco Official Records Must Be Shown to Public—Proposes Tax on Mortgages in New York State—No Six-Cent Fare in Houston.

ROADS AND PAVEMENTS

Federal Aid Law Modified in Post Office Bill.

Washington, D. C.—The following clauses appear in the Post Office Department Appropriation Bill for 1919-20 by the Senate Committee on Post Roads: "Section II of the federal aid road law of 1916 is to be modified so that a post road is interpreted to mean any public road which is now used, or may be made suitable, for the transportation of the United States mails, excluding roads through places with a population of 2500 or more where the houses average less than 200 feet apart. The amount of federal aid in the 1916 law is to be increased by $50,000,000 for the current fiscal year, $75,000,000 for 1920, and $75,000,000 for 1921. Honorably discharged soldiers, sailors and marines are to receive preference, other conditions being equal, when labor is hired for the roads on which these additional funds are used. War material not needed by the War Department but suitable for highway improvement, is to be transferred to the Secretary of Agriculture at the discretion of the Secretary of War, and to be then distributed among the state highway departments for use in federal aid road construction and national forest roads, in the same manner as federal aid funds are now distributed. Appropriations of $3,000,000 annually for the fiscal years 1920, 1921 and 1922 are to be made for cooperative or independent construction of roads in the national forests."

New Indiana Highway Program.

Indianapolis, Ind.—The revised bill for a state highway commission, to have charge of the construction and maintenance of a system of state highways, has been introduced in the senate by senator Luke W. Duffey, of Indianapolis, and in the house by representative Oliver Buller, chairman of the roads committee. The measure is a substitute for the 1917 law, upheld in the state supreme court recently. It makes certain changes from the bill first prepared to meet criticisms as to the great power given to the director, who under the original bill, critics contended, would have had more authority than the state highway commission naming him. The new draft, like the old one, provides for the laying out at the earliest possible moment of "a system of state highways which shall reach each and every county seat of the state and and each and every city or town of over 5,000 inhabitants." Decision as to which part of the system shall be built first is left with the highway commission in the present bill, instead of the provision in the earlier draft that it should be made by "the director with advice of the commission."

The road-building program outlined by those behind the bill would call for a system of 3,500 miles under state control to be in shape at the end of five years, to be paid for out of a state road fund, supplemented by federal aid. Provision is made for taking advantage of the federal road aid act. Under this there would be available $1,500,000 accrued during the last four years; $600,000 to be available during the next year; and if pending legislation passes in the congress, $14,000,000 more in the next five years, the federal payments all being conditioned on the meeting of certain requirements by the state. The state highway commission, it is provided, shall consist of four members, not more than two from the same political party, to be named by the governor for terms of one, two, three and four years, respectively. Successors thereafter would be appointed by the governor for four-year terms. The governor would be empowered to fill any vacancy in the commission and remove any member "after a hearing, for cause." Members of the commission would serve without pay, but would receive actual expenses incurred in the performance of their duties. The bill specifies that the director shall be chosen by the commission "solely for fitness, irrespective of political beliefs or affiliations" and it is provided that he "may be removed by a majority vote of the commission for inefficiency, malfeasance or neglect of duty, after notice and hearing by the commission." The director is to be the executive officer of the commission and in the bill it is set forth that he "shall be subject to the orders and direction of the commission." His salary is fixed at $6,000 a year, exclusive of actual traveling and other expenses incurred in the performance of his duties. With the approval of the commission, he is to have power of appointment and removal over all subordinates. The measure directs that all employes shall be appointed for merit only and that "any undue political activity on the part of any employe, or inefficiency or neglect of duty shall subject such employe to removal." The work of the state highway commission is to be carried on under three divisions, construction, maintenance and auditing with a chief engineer, a superintendent of maintenance and chief clerk, respectively, at the head of each.

If any state highway to be constructed or reconstructed connects at the corporate limits of any city with an unimproved street, the commission would have power to improve it as a part of the state highway, and where the expense per mile of such work is greater than the average expense of improvement of such road outside the corporate limits, the extra expense would have to be paid by the city or town to the state highway fund.

The commission in laying out its state highway system would have power to deviate from the location of a public highway as actually traveled at the time the highway was designated as a state highway under the act "in order to shorten distance, to eliminate steep grades or sharp turns, to widen narrow portions or otherwise promote public convenience and safety." Such parts of a public highway are to be abandoned as a public highway unless the board of county commissioners where the road is situated petitions the highway commission and indicates that it desires to maintain the thoroughfare affected.

Provision is made in the bill that when it is proposed to improve any road, other than a state highway, the cost of which is estimated to be more than $2,000 a mile, or to construct or repair any bridge, cost of which is estimated to be more than $2,000, fifty or more electors in the district to be assessed for the improvement may have the plans and specifications submitted to the state highway commission and no contract may be made for the improvement until the state highway commission has approved the plans and specifications. On a petition by a similar number of electors, provision is made for the state highway commission to assign a representative to inspect the work as it advances and no payment for the work would be legal without his certification that material and work were in accordance with plans and specifications. Provision is made for reimbursement by the board of county commissioners to the state highway fund for the expense incurred in giving such service.

To provide money for the new state highway department and for road building, the bill introduced creates a state highway fund to get all money now in the highway fund, all proceeds of the inheritance tax, all money paid into the state treasury after July 1, this year, collected as motor vehicle registration fees, and all fees for examining and licensing chauffeurs, together with proceeds of a state tax of 10 cents on each $100 of taxable property.

Seven-Ton Vehicle Traffic Limit.

Houston, Tex.—Heavy truck traffic which has caused much damage to the county roads, particularly since the recent heavy rains, is the subject of an order by the county commissioners' court. The new order limits the weight of trucks and load to seven tons. The order assesses a fine of $25 or a jail sentence for violation of the order. At the same time county judge Chester H. Bryan was instructed to take up with the commanding officers of the army camps the matter of limiting the speed at which army trucks shall move over the county roads. Much of the damage to roads, particularly to the Webster Airline road, has been done by heavily laden army trucks moving at high speed. The commanding officers will be asked to issue an order fixing the maximum weight of truck and load to seven tons.

SEWERAGE AND SANITATION

Venereal Disease in the Army.

Washington, D. C.—The following statistics have been issued by the Surgeon General of the Army to show the need of carrying on in civilian life the work so successfully inaugurated in the military service. During the fifty-three weeks ending September 27, 1918, there have been 178,204 venereal disease cases reported under treatment in the United States army in France. Reports indicate that approximately 85 per cent of this number entered the army already infected, and that approximately 15 per cent of all cases reported were contracted after enlistment. During 1917 over three-quarters of a million days were lost to the army because of venereal disease. During these fifty-three weeks there had been a loss of over 2,067,000 days. Coincident with the introduction of preventive medical measures, systematic inspections, and prophylaxis, the annual venereal disease rate dropped from 155 per 1,000 in 1910 to 83.60 per 1,000 in 1915. These were practically all new infections, as men infected with venereal disease were refused at that time admission to the regular army. Under the Surgeon General's program as outlined, the venereal disease rate per 1,000 in the United States (new infections) has dropped from 83.60 per 1,000 in 1915 to approximately 20 per 1,000 in 1918. In the American Expeditionary Forces the annual venereal disease rate has varied from 20 to 40 per 1,000. Many of these cases are traceable to the French licensed houses of prostitution, which have now as far as possible, been placed out of bounds to the United States troops.

State Engineer Declares Disposal Plant Inefficient.

Madison, Wis.—That Madison's sewage disposal plant was not constructed according to the plans adopted, and the recommendations of the consulting engineer, and therefore is not the success it was designed to be, is the substance of a report of W. G. Kirchoffer, consultant sanitary engineer of the state board of health. Mr. Kirchoffer was detailed to study the sewage disposal plant with special reference to the pollution of Lake Monona. In the report, Mr. Kirchoffer details how and where the plans were ignored and the effect of the changes on proper disposal of sewage. Among the points brought out were the following: The plant was not completed in respect to an important settling basin which was to finish the process. The disposal of sludge was not carried out in a scientific manner and is merely a makeshift. The septic sludge passed through the plant and was found in each stage, even in the final effluent. Sludge from the moat about the sprinkling filter, even when mixed with 100 parts of lake water, has little or no stability but is still in a putrefying state. Floating sludge in the moat when mixed with 100 parts of water has a stability of only 50. Pollution of the lake by sewage disposal plant is considered as only one of the many causes of this nuisance. The report recommends that the city complete the sewage disposal plant to conform to the consulting engineer's recommendations and make a thorough examination of all sources of pollution contributary to the lake. Discussing the possible cause for the odors about Lake Monona the report says: "Inasmuch as no chemical or biological investigation was started when the nuisance was the worst, no one who has not thoroughly investigated all the sources of pollution of the lake, and there are many, at the time when they were in evidence, can now say that the cause of the odors was algae, sewage or something else. It is as feasible to suppose that some of the sludge which follows the effluent to the lake is responsible for part of the odor, as to say it is algae. This sludge could settle to the bottom of the lake, ferment in the hot sun, be thrown out on the shore by the waves, there to continue its process of putrefaction. If such conditions have taken place, especially while the filter was unloading in the spring, or during the time the moat was cleared out, it is, in my opinion, the only way in which the effluent from the plant could have caused the odor. If the supernatant liquid from the sludge tanks or the liquid from the settling tanks, when cleaning them, was turned into the lake, these probably would cause an odor, but as this procedure is not continuous it could hardly be expected a nuisance would prevail from this source. Complete chemical and bacteriological examinations into the other cause of offensive odors of Lake Monona have not yet been completed, as the work was started too late in the year to attempt all of it under favorable conditions. Moreover, the laboratory was overcrowded with work. In summing his conclusions as to the sewage disposal plant, the engineer says: "From these investigations, I concluded that the sewage disposal plant is not operating as intended by the consulting engineer, or as it should be, first, because the details of the plant were not properly designed and constructed and, second, because the plant is really not completed, so far as sludge disposal is concerned, or a final settling basin provided. It is my opinion that, had the plant been built according to the recommendations of Mr. Alvord, it would have been highly satisfactory for conditions." The report has been sent to city engineer E. E. Parker at San Diego, Cal., to Alvord & Burdick at Chicago and M. R. Howson at Camp Grant, engineer for the Chicago firm. Mr. Parker will make a thorough study and prepare recommendations for the city.

British National Health Ministry.

London, England.—Dr. Christopher Addison, President of the Local Government Board, has been entrusted with the establishment of the British Ministry of Health. In outlining the work to be done by the new Ministry, Dr. Addison says: "It will be a few months before the Ministry of Health can be established. For many purposes affecting the service the administrative unit must be a large one. A small area cannot possibly be self-contained, in a medical sense. It cannot have resources sufficient to meet all its emergencies. What we seek to establish is really a medical intelligence department. It will have its laboratories with everything necessary for research, and will have access to all information gathered by public medical officers. It is frequently possible to see an epidemic in the distance. We shall soon look to our Intelligence Department to give us due warning of the approach of anything of the kind, and to advise us as to our counter-offensive."

WATER SUPPLY

Towns Refuse to Pay Water Company Bill.

Media, Pa.—Fifteen boroughs and townships were represented at a meeting in Prospect Park, when the commissioners and councilmen decided by a resolution adopted not to pay the water bills submitted to their respective municipalities by the Springfield Consolidated Water Company. The public service commission some time ago made a ruling giving the water company the right to assess the boroughs and the townships the sum of $355 per mile for

every mile of four-inch pipe or over run through the boroughs or townships. The township and borough authorities objected, because it will mean that every one of the municipalities in Delaware County will be forced to increase their tax rates from two to two and a half mills. The boroughs also decided to pool their interests and to engage counsel to carry the case to the Supreme Court of Pennsylvania. The townships and boroughs contend that the ruling of the public service commission is arbitrary and unconstitutional. Springfield township, a farming district, has many miles of pipe running from the water company's works to the consumers in the different townships and boroughs, but has no fire protection. However, this township under the ruling of the commission must pay to the water company between $6,000 and $7,000 as potential fire protection. Clifton Heights, Lansdowne, Aldan, Prospect Park, Norwood, Darby, Sharon Hill, Ridley Park and Yeadon were some of the boroughs represented at the meeting, together with Upper Darby and Haverford townships.

City Water Supply Practically Exhausted.

Wauseon, O.—This town's water supply is reported to be practically gone. No deep well water is being pumped through the mains. The water is now taken wholly from ditches and ponds and is unfit to drink without boiling. The people must rely on private wells to furnish them with drinking water. Many of these wells have been pumped dry. On one day a large tank of water was placed in Wauseon's main street and was labeled, "This is deep well water. Help yourself." Members of the water works board are considering the plan of obtaining water from Bean creek or Maumee river, which would necessitate the construction of a pipe line nine or ten miles in length.

Water Rates Reduced.

Omaha, Neb.—The price of water in Omaha has been reduced 5 per cent., effective Feb. 1. The reduction was voted unanimously at a meeting of the Omaha water board after the excellent showing of the year 1918. The reduction applies to all water consumers who pay the 26¼ cents per 100 cubic feet basic rate. There is at present a 50 per cent. reduction on this rate. The additional 5 per cent. will bring the net rate down to about 12½ cents per 100 cubic feet. "This is the eighth reduction that has been made in water rates since the city took the plant in the summer of 1912," said assistant general manager Larmont. "About 95 per cent. of the water consumers of Omaha will benefit by the new reduction. It does not apply to the big consumers, who constitute only about 5 per cent of the total number The Metropolitan Water district did more business last year than ever before. This is attributable to the natural rapid growth of Omaha." A new 30,000,000-gallon centrifugal pump is now being installed at the water plant in Florence, greatly increasing the capacity. At present there are two pumps pumping water from the reservoirs to the city mains, one of 20,000,0000 gallons daily capacity and one of 18,000,000 gallons. Four pumps lift the water from the river to the reservoirs. These have capacities of 30,000,000, 20,000,000, 12,000,000 and 10,000,000 gallons respectively.

STREET LIGHTING AND POWER

Enforcement of Lower Rate Restrained.

Albany, N. Y.—The Municipal Gas company, with the backing of a temporary order of the Supreme Court, has put into effect the $1.30 rate per 1,000 cubic feet of gas, beginning Feb. 1. Carl H. Graf, the head of the gas company, has issued a statement setting forth that the "company will enforce the $1.30 rate immediately." He stated, however, that the higher rate would apply only to gas consumed from Feb. 1 and will therefore not be charged in any bills for January gas. Justice Hasbrouck at Kingston granted a temporary injunction restraining the city of Albany, state of New York and public service commission, second district, from interfering with the gas company in putting its higher rate into effect. The gas company gave a bond of $1,000 to cover costs, in addition to the $100,000 bond filed by the company some time ago to reimburse consumers for excess charges should the company ultimately lose its fight for the higher rate. The higher rate will continue until a further order of the court. The company's contention is that the law of 1907 fixing the $1 rate is confiscatory in that gas can no longer be manufactured and sold at that rate without a loss, and that the law is therefore unconstitutional.

Secretary Lane for Comprehensive Power Development.

Washington, D. C.—Predicting a greatly increased demand for power for use in industrial activity and expansion, Franklin K. Lane, Secretary of the Interior, has submitted to Chairman Sherley of the House Appropriations Committee a request for an appropriation of $200,000 to be spent in making a special investigation and report on the power supply of the whole industrial region between Boston and the city of Washington. Mr. Lane says that the investigation will form the basis for a constructive national policy of the highest industrial and economic significance. In his letter, Mr. Lane says:

> The country is passing through a period of transition, which, I firmly believe, will soon be followed by one of industrial activity and expansion. The enormous development of war industries created an almost insatiable demand for power, a demand that was overreaching the available supply with such rapidity that, had hostilities continued, it is certain that we should now be facing an extreme shortage of power. Such a crisis was averted by the signing of the armistice and the ensuing curtailment in the demand for war materials has carried up past immediate danger of a power famine in the industral districts of the Northeast.

One suggestion for a system of power supply which Secretary Lane favors is that steel tower transmission lines be constructed extending from the city of Boston westward past Worcester and Springfield, crossing the Hudson River in the vicinity of Newburgh or Poughkeepsie, and then swinging southwest to Northern New Jersey and across the Delaware somewhere near Easton, crossing Southeastern Pennsylvania, inland from Philadelphia, striking the Susquehanna River below York, and then extending southeastward into the vicinity of Washington. It has been suggested that such a trunk line could be tied to the existing power stations in Boston, Worcester, Springfield, Hartford, Poughkeepsie, New York City, Newark, Paterson, Trenton, South Bethlehem, Philadelphia, Wilmington, Chester, Harrisburg, York, Lancaster, Baltimore and Washington. Through such an inter-connection of existing large power stations, experts believe, a much higher efficiency can be obtained from existing power equipment, by taking advantage of differences in load conditions to obtain more complete use of the power equipment. In the region between Boston and Washington there is power producing machinery capable of 8,500,000 horse-power, half of which is in industrial plants and the other half owned by public service corporations and electric railways. This equipment is being increased by from 500,000 to 1,000,000 horsepower annually. Secretary Lane's idea is that these additions of new equipment should be made in harmony with a comprehensive plan of power production to be determined upon in advance and followed in such manner as to bring into use the undeveloped water power as soon as possible. Mr. Lane writes:

> In a few months, and especially in the regions mentioned, I anticipate a greatly increased demand for energy, for which present facilities are inadequate. This demand will follow the resumption of industry under the operation of normal economic laws and in the face of international competition, factors that have been largely inoperative during the war. If the country is to reap the full benefit of this returning wave of activity it must be prepared to furnish industry and transportation with an adequate, dependable, and economical power supply. Only by increased economy in the production and distribution of power will it be possible for our manufacturers to decrease their production expenses and compete successfully in the world's markets, maintaining at the same time the American standard of wages and living.

"This result will be accomplished by the inter-connection of existing power centres with a trunk line transmission system of high efficiency. Into this trunk line, energy will be fed from hydro-electric plants and steam power sta-

tions located at tidewater and near the coal mines. From it will be taken the power required for each principal industrial centre and for the electrification of trunk line railroads and of such branch lines as may be located in metropolitan districts. Such a comprehensive system of power supply, making use of unutilized or undeveloped water power and of fuel now wasted at the mines, will result in large savings in coal. A very large amount of coal now consumed by steam power plants can be replaced by the development of water power. Fuel power can be developed near the mines and the wasteful transportation of coal by railroads to that extent avoided.

I am reliably informed that as a conservative estimate 50 per cent of the fuel now used by the railroads in this territory can be saved through the operation of trains by electricity instead of by steam locomotives, because of the much higher efficiency that can be obtained in the economical central station in comparison with the wasteful steam locomotive.

The transmission of this energy as electricity instead of the hauling of coal by rail will relieve the railroads of this territory of an enormous freight burden, thereby making available transportation for the hauling of other commodities. Not only would the railroads in the immediate territory be relieved of hauling the coal for their own locomotives, but other railroads supplying them with coal would be relieved proportionately. This easing of the present strain on trackage and equipment would result automatically in an increase in transportation facilities, the necessity for which the country is now facing."

FIRE AND POLICE

Police and Firemen Present Pension Bill.

Trenton, N. J.—The joint committee of policemen and firemen of the state recently appointed to prepare a pension bill for the two departments agreed on the form of bill they want to present to the legislature. The form of the new bill calls for the two per cent payment by the members as at present, but increases the tax on the city to four per cent, or double what is being paid now. It also calls for the city to make up any deficiency that may at any time arise in the fund, if at all. In return the two funds will relinquish all claims on revenues which they are now receiving, and accumulated surplus from those revenues, fines of members alone excepted. The benefits under the new bill will be the same as now, except that benefits to parents will be eliminated, the widow alone becoming a beneficiary, except when there are dependent children. Where there is one child and the mother is dead, or remarries, the allowance will be $25 a month for the child, $40 for two children, and the present amount for three or more until the youngest reaches the age of sixteen. The widow's pension ceases at remarriage. A hard fight was put up by some of the members of the committee to try and have the maximum amount of a yearly pension placed at $1,000, but it was voted down, the firemen particularly opposing it. There was also a fight against widows of retired policemen or firemen being allowed to drew a pension equal to half of the husband's pay after his retirement, but the friends of the women were again in the majority. Action of the committee followed the organization of opposition to the Pierson measure on the subject. Meetings were held which adopted resolutions against the Pierson bill. They received support by city officials in a number of cities. The men believe that the new bill should be drafted along the line of the present police and fire pension laws, with slight modifications. Under the present law the men pay two per cent of their salary to the support of the fund, and the city contributes a like amount. Under the proposed bill the city's assessment will be increased to four per cent, but the aggregate amount the city will have to pay under the proposed new law, it was claimed by the committee, will be about $10,000 less the first year than the amount paid by the city last year. This will be brought about, it was explained, by the fact that both policemen and firemen under the new bill will receive nothing from many revenues in which they now share, including licenses of various kinds, fines, etc. These things, under the new bill, will go direct to the city treasury. The only revenue the two bodies' fund would have, in addition to the percentage tax on the members and on the city, would be that derived from fines imposed on their own members for infractions of department rules. The following constituted the committee which drafted resolutions voicing the protest of policemen and firemen of the state: Henry Gourley, president of the State Patrolmen's Benevolent Association; Robert Campbell, president of the State Firemen's Mutual Benefit Association; chief of police Long, of Newark; inspector Corbally, lieutenant John A. Brady, secretary to the committee; George Steele, secretary of the State Firemen's Mutual Benefit Association; Edward Davey, secretary of the State Patrolmen's Benevolent Association; fireman Thomas Plunkett, of Hoboken; fireman Charles Duffy, of Newark, and fireman James Donohue, of Jersey City.

Two Platoon System Installed.

Lima, O.—The double platoon system has been inaugurated in the fire department announcement by safety director E. W. Hiner. The plan which has been worked out by Hiner and fire chief Mack provides for two platoons of firemen, one of which will be on duty, while the men off duty will be subject to call in case of emergency. The day shift will be of ten hours' duration, from 7 a. m. until 5 p. m., the night shift being on duty the remainder of the twenty-four hours. The shifts will change from night to day once a week. Under the new system the firemen will not be allowed any full days off duty, will not be given time off at meal hours and will not be allowed a two weeks' vacation annually. Men working on the day shift must either carry their dinners to the station with them or have them sent to them. While in the past the men have been given meal hours, one day off in six and a two weeks' vacation with pay each year, it is estimated that the firemen will have as much or more time to themselves under the new platoon plan. Every man in the fire department will be assigned definitely to one or the other of the two platoons. It will be forbidden for him to trade shifts with another man. A substitute must be provided in case any fireman secures a leave of absence, while the absent fireman will not be allowed pay during the time that he is away from duty. All firemen in the department have been ordered to install telephones in their homes, so that they may be reached at any time in case of an emergency. No man hereafter may leave the city without first notifying chief Mack. In the opinion of safety director Hiner, the new plan will do away with the unsettled conditions which have prevailed in the department during the past few years. Under the old system, he stated, it has been possible for men to be absent from duty without the knowledge of the chief as there has been no effective means of knowing the whereabouts of each man at all times. While the introduction of the new system is not final, the plan will be given a thorough trial and if it proves successful, the city council will be called upon to enact the legislation necessary to make it effective.

GOVERNMENT AND FINANCE

Official Records Must Be Shown to Research Bureau.

San Francisco, Cal.—The secrets of the Hetch-Hetchy water projects must be thrown open by city engineer M. M. O'Shaughnessy and the board of public works for inspection by the San Francisco Bureau of Government Research, by virtue of a writ of mandate issued by superior judge George E. Crothers. The research bureau won a fight that started more than a year ago when W. B. Holton, at that time director of the bureau, asked for and was denied permission to inspect the data and records involving Hetch-Hetchy. O'Shaughnessy told Holton to go to the board of public works. The board told him to go to the mayor and the supervisors. The mayor and the supervisors, by a vote of 14 to 2, told the director he'd have to go to the courts for satisfaction. The bureau went to the courts. The Civic League of Improvement Clubs got behind it in its fight. The bureau stood on

the right of any citizen to see any records of the city. The bureau has now won its fight. Judge Crothers held that any citizen has a right to inspect any public data except those prepared for use in defending the city against a lawsuit. By Judge Crothers' decision, engineer O'Shaughnessy and the board of works must throw open to public inspection all the records and data of the entire Hetch-Hetchy project. Even without the benefits of O'Shaughnessy's records, Holton announced that the research bureau would continue the investigation of Hetch-Hetchy it has started. He said the project itself, without any of its attending data, furnished room enough for a long investigation. At the time O'Shaughnessy appeared before the supervisors to defend his refusal to permit inspection of the work, the city engineer is reported to have said: "We can't afford to have the city's great works investigated by every Tom, Dick and Harry you pick up on the sidewalk—every man who may have built a sewer in Portland or a manhole in Manila." O'Shaughnessy was asked to come to a meeting and answer questions about Hetch-Hetchy. O'Shaughnessy is reported to have said, he was willing, provided the league appointed a committee and agreed to hold the interview behind closed doors. Then the board of public works wrote to the Civil League that it was willing to permit its members to inspect "completed" records of O'Shaughnessy, who was to be the judge whether or not records were completed. Throughout the arguments the city authorities took the position that agencies that might be opposed to the Hetch-Hetchy project, and therefore might criticise it, should not be permitted to inspect its records.

Economy Regime for San Jose.

San Jose, Cal.—In order to get city expenditures within the budget allowances, sweeping reductions in the health and police departments have been ordered by the common council and half of the street lights have been ordered out. The rule was effective February 1. Joseph Lazier, city sanitary inspector and four members of the police department, are to be cut off the pay roll. W. C. Bailey, the city manager, will contribute $150 a month of his salary temporarily to the expenses of the health department, which is spending slightly more than the budget allowance, on account of the influenza epidemic, now practically under control, however. There will be no effort to save money by cutting down the personnel of the fire department, it was announced.

Virginia Has "Complaint Box."

Richmond, Va.—Governor Westmoreland Davis has installed a "suggestions and complaints" box in his office. It is in connection with the budget division of the executive office and will be administered by the budget assistant, an office for which the new Virginia budget law provides. The governor has announced that he wants suggestions, complaints, and criticisms from any citizen regarding the affairs of state, and especially invites them from state officials and employees. He says he is determined that state affairs shall be administered as efficiently and economically as possible under present conditions and that they shall respond fully to the will of the people of Virginia. Persons with suggestions regarding the manner in which the state's government could be bettered and those who have a "kick" to register have but to place them in writing in the complaint box and they will be investigated. If it is found that the state's service can be improved, the governor says the suggestions will be followed up and credit given to the person who offered them. Last Feb. 19, less than three weeks after Governor Davis had taken office, on a programme calling for an "Executive budget," the new budget law was enacted by the legislature, establishing complete coordination of revenues and expenditures of the state, and insuring greater executive supervision and control of all state affairs. Every two years, under the new law, the governor is required to make a careful survey of all state departments and institutions in order to possess a working knowledge on which to base his recommendations to the assembly. Within five days after the beginning of the session of the general assembly, the governor must submit his budget, together with a general survey of the state's financial resources and a review of the general economic, industrial, and commercial conditions. This must be accompanied by a tentative budget bill. Within five days the committees in charge of appropriation measures of both houses must sit jointly to hear appeals, the governor having the right to be heard on all matters coming before the committee. The assembly may increase or decrease items in the budget bill. Additional or special appropriation bills may not, however, be considered except in case of emergency, by either house until the budget bill has been finally acted upon. All special bills introduced must be itemized in accordance with the classifications used in the budget. This forces an early consideration of the budget; it directs attention to the condition of the treasury at the same time, and checks the flow of local and political appropriation measures until after the assembly has had an opportunity to consider and provide for the constructive business of the state.

Proposes Tax on Mortgages.

Albany, N. Y.—An annual tax on mortgages in place of the present antiquated recording fee is advocated by state controller Travis to increase substantially the state's revenues. In explaining this suggestion, the controller shows that the tax of $292,971 collected for the last quarter was at a rate so insignificant as to be merely nothing more than an exemption fee. "A few years ago," explained the controller in citing an example of how the present law works, "one of the largest corporations in the state issued $49,000,000 worth of bonds payable in 2361. The owner of one of these bonds can to-day take it to the county clerk's office where the mortgage was first reported and pay a tax of $5, procuring exemption from further taxation for the next 443 years. Can it be said that such a tax, which is slightly more than 1 cent per year for each $1,000 is in fact a tax? Afterwards, another corporation issued $94,000,000, due in 1997. By paying $5 on a $1,000 bond of this issue, it is possible for the holder to obtain exemption from taxation for the next eighty years. In that case the annual tax on $1,000 of personalty is approximately six cents. Moreover, as to bonds secured by a mortgage covering real property partly within and partly without the state, the owner has, by reason of the payment of the mortgage recording tax, an exemption for a portion of his bond, but the remainder thereof can be made tax exempt only through the Investment Tax law. Under the Mortgage Recording Tax act, a part of the bond is exempt for life; and under the Investment Tax law the other portion can be made exempt for not more than five years. No such a condition as that should exist. Put simply, the mortgage-recording tax is not a tax, as the rate is so insignificant that it can be characterized as nothing more than an exemption fee."

STREET CLEANING AND REFUSE DISPOSAL

To Sell Grease and Tankage in Open Market

Columbus, O.—Council has passed, and mayor George J. Karb has approved, an emergency ordinance authorizing the board of purchase to sell the products of the garbage reduction plant in the open market. According to the ordinance, bids were received January 13 by the board of purchase; for the sale of garbage grease and tankage produced by the garbage reduction plant and being unsatisfactory, all bids were rejected. Such material, says the ordinance, should be sold because of limited storage facilities. Council declares in the measure that better prices can be secured for grease and tankage by selling it in the open market, until such a time as market conditions improve and therefore the board of purchase is directed to offer garbage grease and tankage for sale in the open market and to enter into contracts for the sale of such quantities as they may deem advisable until conditions are such as to warrant again advertising for bids.

Ten Year Contract for Garbage Disposal.

San Francisco, Cal.—The board of public works has awarded the contract for the disposal of wet garbage to Charles F. Reddy. Reddy was the sole bidder for the garbage contract and will pay the city $1.26 a ton, amounting to about $50,000 a year. The contract was awarded following a conference between chairman Andrew J. Gallagher of the special garbage committee of the board of supervisors, city attorney George Lull and members of the board of works. The contract runs for ten years. Reddy will receive wet garbage at three receiving stations, according to supervisor Gallagher. The stations will be established at North Point, Islais Creek and at the end of Channel street. Consumption of the contract depends upon passage by the supervisors of an ordinance providing for the segregation of wet and dry garbage. Gallagher's committee is now working out plans to purchase garbage containers and sell them at cost. The committee is also seeking to establish uniform rates to be charged by scavengers.

TRAFFIC AND TRANSPORATION

6-Cent Fare Lost in Houston.

Houston, Tex.—The city administration has passed an ordinance eliminating the six-cent fare and restoring the five-cent fare, following the decision of the district court denying the petition of the Houston Electric Company seeking mandamus to force the commission to permit the railway to collect six-cent fares as provided in the city ordinance adopted last September. When the six-cent fare ordinance was passed a petition from the necessary number of voters was presented asking for a referendum on the question and at the election the higher fare was defeated by an overwhelming majority. The company took the matter into the courts, declaring that the commission had no authority to delegate its rate-making powers to the voters through the referendum—and the court decided against the contention.

St. Louis Wins Car Company Taxes.

St. Louis, Mo.—The city and the United Railways have reached an agreement on the question of the company's mill tax suits, amounting to $2,300,000. The United Railways agreed that it would pay every dollar that it owes the city in mill taxes, including both principal and interest, and, also, a judgment against the St. Louis Transit Company for about $250,000. The obligations are to be paid in ten installments, with interest, amounting to approximately $250,000 a year. The company also binds itself to pay the mill tax in the future without contest as it falls due. On April 4, 1903, a measure known as the mill tax ordinance became effective. This ordinance provided for a license tax of 1 mill per passenger on street railways doing business in St. Louis. The United Railways from the very beginning contested the validity of this tax and litigation between the city and the company ensued, which ended, in so far as the original cases were concerned, by a decision of the Supreme Court of the United States in 1916 in favor of the city. As the result of this thirteen years' litigation the United Railways Company paid into the treasury of the city approximately $1,800,000. No tax has since been paid under the ordinance. Immediately upon the final determination of the 6-cent fare case by the Supreme Court the mayor instructed the law department to proceed to collect, if possible, the balance of the mill tax, not in judgment, and which amounts, in round figures, with interest, to $2,500,000. Suit for the major portion of this amount has been pending awaiting the fate of the rate case and was also passed awaiting the result of franchise compromise ordinances and settlements which were being suggested and proposed from time to time. Accordingly, the city counselor made demand upon the company to file its answer in these cases so that steps could be taken by the city to force the tax claims under this ordinance to a judgment.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Acquisition of Land by City—Construction of Street Railroad.

(Tex. Civ. App.) Vernon's Sayles' Ann. Civ. St. 1914, art. 783a, providing that cities on navigable streams and under special charters may extend their limits for the purpose of acquiring land for improvements of navigation, does not authorize a city upon passage of an ordinance thereunder to construct a steam railroad along a street included in such extended limits.—City of Orange v. Rector, 205 S. W. 503.

The owners of residence property abutting a street have the right to enjoin the city from constructing a steam railroad thereon without lawful authority, upon showing special damages to property and personal discomfiture, whether plaintiffs owned the fee to the street or not.—Id.

Limitation of Powers of Municipality.

(Fla.) If a reasonable doubt exists as to a particular power of a municipality, it should be resolved against the city.—Ex. parte Davidson, 79 So. 727.

A general clause conferring power upon a municipality can give no authority to abrogate the limitations contained in special provisions.—Id.

Where authority as to a particular subject is expressly conferred on municipalities, other authority inconsistent with the powers expressly given is not to be impled, particularly when the powers given do not include all the authority as to the designated subjects.—Id.

Land Used for Educational Purposes—Assessment.

(Cal. App.) A strip of land owned by a state university and adjoining land, used for educational purposes, cannot be subjected to street assessment lien, unless it is divisible from land used for educational purposes, and can be separated therefrom without impairing use to which such land is being put by university.—Raisch v. Regents of University of California, 174 P. 943.

A strip of land fronting on a street, and constituting about one-seventh of a block owned by a state university, six-sevenths of which was occupied by college buildings, held not separable from the remainder without impairing its use, and hence not assessable.—Id.

Land occupied by college buildings of a state university, being devoted to public use, is not subject to street improvement assessment.—Id.

Indebtedness Beyond Limit—Enforceable Contract for Purchase of Waterworks.

(U. S. C. C. A. Ky.) Const. Ky. § 157, prohibited a city from incurring indebtedness in any year beyond the year's income unless authorized by vote, from granting any franchise except to the highest bidder, and from incurring indebtedness beyond a fixed limit "except when authorized under laws in force prior to the adoption of this Constitution." In 1890 the city by ordinance granted a franchise to a water company for 20 years and agreed to pay a yearly sum for fire hydrants, and also before or at the end on the term to buy the waterworks at appraised value, or to extend the company's "rights and privileges" for 20 years. Held, that the ordinance constituted a contract binding the city to either buy or extend; that, having elected to purchase and have the property appraised, its contract was within the exception as "authorized" under prior laws, and enforceable, although it increased the indebtedness beyond the constitutional limit.—Ashland Waterworks Co. v. City of Ashland, 251 F. 492.

A constitutional provision prohibiting a city from incurring any indebtedness beyond a certain limit, unless authorized by a two-thirds vote at a special election, does not require such an election, where for any reason the proposed indebtedness is not within the prohibition.—Id.

NEWS OF THE SOCIETIES

Feb. 25-28, 1919.—AMERICAN ROAD BUILDERS' ASSOCIATION. Sixteenth annual convention and Ninth American Good Roads Congress under the auspices of the A. R. B. A., Hotel McAlpin, New York, N. Y. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

Nov. 12-14, 1919.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

Lincoln Highway Association.

The board of directors of the national Lincoln Highway Association met in Detroit recently for their annual election of officers and to consider many questions which have arisen for the action of the board during 1918, and to lay plans for the 1919 season.

This was the first meeting of the directorate of the Lincoln Highway Association since the ending of the war, and the first one in two years at which it has been possible to secure the presence of a number of the men who have been most prominently identified with the work of the organization in the past, and who, for the duration of the war, had been engaged in governmental activities.

Henry B. Joy, who was for four years president of the Lincoln Highway Association and who resigned Jan. 1, 1918, following his entering the service, was present at the meeting and was unanimously elected vice-president of the organization for 1919. F. A. Seiberling, president of the Goodyear Tire & Rubber Company, under whose leadership as president of the Lincoln Highway Association so much tangible progress was accomplished in 1918, was unanimously re-elected president of the organization.

R. D. Chapin, president of the Hudson Motor Car Company, and who was for the duration of the war Chairman of the Highways Transport Committee of the Council of National Defense, was re-elected vice-president, as was Carl G. Fisher of Indianapolis and Miami, Florida.

Mr. Chapin brought out in his address to the board his belief that American public opinion was crystallizing upon the necessity for federal action in connection with construction of interstate highways like the Lincoln Highway, and that the war had in his opinion served to advance the enlightenment of the American public in connection with the question of highway improvement by more than a decade. Mr. Chapin predicted, as a result of the growing demand from every section of the Union for greater federal aid in connection with proper improvements, an early additional appropriation by congress, to supplement the money already available under the Bankhead-Shackleford Act for assistance to the various state highway departments. He also stated that he hoped a period of two years would see a law written upon the statute books of the United States providing for the laying out and constructing at government expense the main highways of the country, including the Lincoln Highway.

Mr. Seiberling stated that he felt that in two years every state traversed by the Lincoln Highway whose financial possibilities in any way allowed of the proper improvement of that route, would have taken care of the highway problem. He added that the Lincoln Highway Association itself was as rapidly as possible taking care of those situations in western states, where finances were inadequate to meet their own problems, and that two years more would practically see the elimination of the poor sections in Wyoming, Utah and Nevada by the expenditure of funds contributed to and administered by the association for this purpose.

In their report to the directors, field secretary H. C. Ostermann and secretary A. F. Bement brought out that $2,996,307.77 had been spent on the improvement of the Lincoln Highway during 1918 even in the face of the manifold difficulties presented by the war situation, an amount greater than expended in 1917 and which brought the total funds expended upon Lincoln Highway improvement since the organization of the association to $15,055,392.71.

The board elected for 1919 was identical with the previous board, with the addition of Mr. Alvan Macauley, president of the Packard Motor Car Company. The officers and directors of the association for the coming year will, therefore, be: F. A. Seiberling, president; Henry B. Joy, vice-president; R. D. Chapin, vice-president; Carl G. Fisher, vice-president; A. F. Bement, vice-president and secretary; H. C. Ostermann, vice-president and field secretary; Emory W. Clark, treasurer. Directors: Russell A. Alger, James A. Allison, Hon. Albert J. Beveridge, Henry F. Campbell, Paul H. Deming, A. Y. Gowen, Alvan Macauley, John N. Willys.

The Associated Highways of America.

Delegates from 37 good roads associations, each of which has a trail of more than 500 miles touching at least three states, held their first nation-wide conference on Jan. 22 in Kansas City, Mo., and perfected permanent organization, choosing "The Associated Highways of America" as the official title and electing C. F. Adams, president of the Pike's Peak Ocean-to-Ocean highway, as president.

Every state except Massachusetts was represented by delegates.

Resolutions setting forth the purpose of the new league were adopted. "A well defined and connected system of improved highways, in order to expedite the distribution of large volumes of foodstuffs, 50 per cent. of which now are wasted on account of the lack of prompt and adequate highway transportation, is one of the greatest ends to be sought," the resolutions say.

(Continued on page 141)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Aberdeen, S. D., is to build a SEWER SYSTEM to cost $200,000. The consulting engineers are Burns & McDonnell.

A SANITARY SEWER SYSTEM is to be built by the city of Aurelia, Ia., according to plans prepared by the consulting engineer, C. H. Currie.

Rock Island, Ill., is to make PAVING IMPROVEMENTS according to plans being prepared by the consulting engineer, W. S. Shields.

PAVING IMPROVEMENTS for which about $150,000 is available are to be made by the city of New Iberia, La., according to plans prepared by the consulting engineer, J. B. McCrary.

Pawnee county, Larned, Kan., has had preliminary surveys made for PAVING IMPROVEMENTS on the Santa Fe trail, involving paving with brick on concrete base, 23 miles long, 18 feet wide. The consulting engineers are Black & Veatch.

A complete SEWER SYSTEM is to be installed by Laredo, Tex. Plans are in course of preparation by the A. Jones Engineering Co.

WATERWORKS IMPROVEMENTS are to be made by the city of Bellefontaine, O., to cost $100,000. Plans have been prepared by the consulting engineers, W. J. Sherman Co.

Princess Anne, Md., is to build a WATER DISTRIBUTION SYSTEM, including tanks, pump and pipe, to cost about $60,000. The consulting engineer is L. J. Houston.

WATERWORKS and PAVING IMPROVEMENTS are contemplated by Gloucester, N. J., acording to plans prepared by the consulting engineers, Remington & Vosbury.

Plans are about completed for the construction of a BRIDGE over the Monongahela river, Fairmont, W. Va., 1,266 feet long, 56 feet wide, with 40-foot roadway. The consulting engineering firm is the Concrete Steel Engineering Co.

INDUSTRIAL NEWS

Protest Against Increased Freight Rates on Road Construction Materials.

Vigorous protest is being aroused by the proposed increase in freight rates by the Railroad Administration on necessary road-building materials in the Middle West. A hearing was held in Chicago Jan. 30, before the Central District Freight Traffic Committee, at which about four hundred representatives of the industries affected by the proposed rate action were present. The proposed increase is on sand, gravel, crushed stone and slag and is on a mileage scale with excess for two line hauls. The area which will be affected is practically that south of the Great Lakes and north of the Ohio River and extending east from the Illinois-Indiana state line to include the western part of Pennsylvania. The increases would range from 10 to 90 per cent, with the averages about 25 to 40.

That these increases would seriously curtail very necessary highway construction at this time when all possible public work is being urged by government officials, was the main reason for protest. "If it goes through," said S. E. Bradt, state highway commissioner of Illinois, "Gov. Lowden will hesitate a long time before he starts spending the $60,000,000 for good roads in Illinois." "We have a bond issue of $50,000,000 for good roads on which we will vote at the April elections," said J. H. Bateman, assistant highway commissioner of Michigan. "The freight increase will play havoc with our program."

"Here is the way I figure out the proposed rates," explained commissioner Bradt. "We will ship a ton from Janesville to Park Ridge, a distance of ninety-eight miles. The price was 30 cents until last June. Then the cost was raised to 50 cents, and now it is proposed to raise it to 95 cents.

"You can figure out how much that means in road construction when you estimate that 6,000 tons must be used to each mile. With the increase in rates last June the cost of the Illinois road program was raised from $60,000,000 to $64,000,000. This proposed raise adds on at least $4,000,000 more.

"Take a ton from Joliet to Springfield, 148 miles. It cost 53 cents until June, then 70 cents, and now it is proposed to make it $1.20. Another illustration is from Racine to Evanston, fifty-two miles. The increase was from 40 to 60 cents last June and the proposal is for 85. The raise from Joliet to Pontiac, fifty-five miles, is from 47 cents to 70 cents, and now to 85 cents."

Assistant commissioner Bateman from Michigan applied the rates to the construction of the Detroit-Monroe road, constructed last year. "The freight on the sand and gravel for this job cost $2,400 a mile before June, when the cost was increased to $3,200, and now it is proposed to make it $5,200," he said.

H. C. Barlow, representing the Chicago Association of Commerce, said that with the present federal direction of railways there is logically no such thing as a two-line haul, and the increased rate proposed over single-line haul is an absurdity. He said that present rates are excessive and unjust; they should be reduced and not increased. Other speakers condemned the mileage scale as a basis for fixing rates. Producers had established their plants and built up their markets on the old rate-making basis, and the change to a mileage scale would disorganize everything accomplished. Figures were presented by large producers showing that the new scale would increase the cost of shipments to their regular markets from 10 to 150 per cent. In some instances, it was asserted, the increase would completely exclude the producer from his best markets and might even force him to discontinue business.

Resolutions protesting against the proposed increases, which had been adopted by the National Crushed Stone association, were laid before the committee.

The legislatures of Ohio, Michigan and Indiana have passed resolutions of protest and these were read at the hearing by official delegates from these bodies. The Ohio legislature resolution, which is typical of the others, "respectfully but most urgently requests the president of the United States, congress, and the railroad administration to take such action as will immediately and effectively prevent an upward revision in the freight rates upon materials entering into the construction of public works."

Dale F. Stansbury, assistant attorney general of Indiana; O. P. Gothlin, of the Indiana public service commission; B. F. Affleck, of the United Federation of Construction Industries, and John M. Glenn, of the Illinois Manufacturers Association, were among the other speakers at the hearing.

National Crushed Stone Association.

The first annual convention of the National Crushed Stone Association will be held at the Iroquois Hotel, Buffalo, N. Y., Feb. 11-12, 1919. The association was formed in Chicago in February, 1918.

NEWS OF THE SOCIETIES

(*Continued from page 140*)

A national highway system to be built and maintained in whole or in part by the national government also is to be urged, the resolutions set forth.

The movement was launched at the recent Chicago conference of the American Association of State Highway Officials and the Highway Industries Association. A temporary organization was then formed with Frank A. Davis of Kansas City, temporary secretary. These associations were represented: Yellowstone Trail Association, Lincoln Highway Association, Pikes Peak Ocean-to-Ocean Highway Association, National Old Trails Association, Jefferson Highway Association, King of Trails Association, Dallas-Canadian-Denver Association, Burlington Way Association, Daniel Boone Trails Association, Sunshine Highway Association, Albert Pike Highway Association, Mississippi Scenic Highway Association, Diagonal Trail Association.

New York State Conference of Mayors and Other City Officials.

Needed legislation affecting municipalities formed the principal matter for consideration at the mid-winter conference of city officials of New York state held under the auspices of the Conference of Mayors and Other City Officials at Albany, Jan. 20 to 22. President Walter R. Stone, mayor of Syracuse, spoke on the subject "Problems Which New York Cities Are Facing," and mayor Foster Studholme, of Olean, discussed the hydro-electric power bill proposed by the conference and which will be acted upon by the present legislature. The permissive municipal ownership bill was explained by mayor George S. Buck, of Buffalo. Another speaker was mayor Mark I. Koon, of Auburn, who spoke on municipal readjustment problems.

A round table discussion of taxation and revenue problems was the principal feature of the closing session.

The conference made public a statement signed by president Stone and mayor Cornelius F. Burns, of Troy, chairman of the conference's general legislative committee, which read in part as follows:

"The permissive municipal ownership bill which will be introduced in the legislature this week places a municipal utility on the same basis as a private utility by submitting it to the same regulations and affording it the same protection. After a most careful study of the utility problem we believe that this is the only effective way to guarantee efficient and economical service under either municipal or private ownership. If this bill becomes a law in substantially the same form as it is presented, we believe that any city which is not getting proper service from a private utility can either obtain or provide it. On the other hand as long as a private utility gives good service at reasonable rates, it can enjoy the protection which it must have in order to operate.

"To the public service commission is given the same jurisdiction over rates, service, issuance of securities, operation of a utility and keeping of accounts as it now has over municipal and private utilities. It, however, adds one feature not contained in existing laws affecting the regulation of utilities. By means of the initiative and

referendum the regulating body—the public service commission—is made amenable to public opinion.

"The procedure for acquirement, establishment, financing, maintenance, operation and control has been very carefully worked out so as to guard against

1. Hastily or ill-advised action by a municipality and its officials.
2. Unloading on a municipality by a private utility.
3. Collusion between public and utility officials.
4. Inefficient or costly service.
5. Improper management and financing.
6. Unjust attacks on private utilities which give good service at reasonable rates."

W. P. Capes, secretary of the conference, said: "The committee of experts and the Conference Advisory Committee have agreed on the fundamental principles of the measure, and all that remains is to work out the details. This will only require a short time. We are now seeking expert opinion on various tentative provisions in the bill, such as those dealing with the financing of a utility civil service regulations, condemnation proceedings, etc. Municipal ownership, or operation, or both, of utilities with state regulation, which will be amendable to public opinion, is the plan which the conference will present to the legislature. Through a committee of experts the State Bureau of Municipal Information and the Conference Advisory Committee have made a searching study of municipal ownership laws in the United States, as have learned the strong and weak features of each scheme and have worked out a plan which we believe eliminates all the weak points in laws now in effect and contains all of the strong features."

In general, the bill provides that upon petition of 20 per cent of the electors the municipal board of a city may ask for authority to undertake by purchase or condemnation or by construction the ownership of its own street railway or lighting system; or the petition may be for a referendum of the people to direct that such negotiations begin. The municipal board shall thereupon make what bargain it can with the public utility for acquisition of its property, or if it is unable to agree with the owners of the property it may recommend condemnation or the construction of a new system. Its decision, whatsoever it may be, with all the findings and estimates next goes to the Public Service Commission for approval or disapproval. If approved it goes back to vote of the people of the city.

Virginia Good Roads Association.

The eighth annual convention of the Virginia Good Roads Association was held at the Murphy Hotel auditorium of Richmond, Va., January 14, 15 and 16. The meeting was attended by good roads advocates from all over the state, numbering almost 300.

The opening address was by Governor Westmoreland Davis on "Future Highway Improvement in Virginia." The governor received an ovation when he proposed to raise $25,000,000 for the immediate construction of 1,200 miles of good roads in the state highway system by levying a special tax of one mill and increasing the automobile license rates 50 per cent. He declared that he wanted to be known as the "Good Roads Governor," and believed that since the war was over Virginia should address herself to the building of a great system of highways of a lasting character.

Governor Davis declared that at the rate we are going it would take sixty-five years and cost in original construction $75,000,000 to carry out the state highway program adopted by the General Assembly of 1918.

Fortified with carefully prepared statistical tables Governor Davis showed how under his plan a total of $39,000,000 could be made available for good roads construction and maintenance during the period 1920-28, of which approximately $12,000,000 would be for maintenance alone. He argued that during this period $22,000,000 would come from the mill tax and automobile licenses; about $4,500,000 from the Federal Government, even under the present "distinctly unsatisfying" system of Federal aid, and about $1,125,000 in convict labor. In 1928, he stated, under this plan we would have the roads, with no outstanding debt, and the work could be continued indefinitely on the same basis if the people desired it.

Motor parcel-post routes were discussed by James I. Blakslee, Fourth Assistant Postmaster General.

At the afternoon session state highway commissioner G. P. Coleman spoke on "Ways and Means for the Construction of the State Highway System." He declared that the drafting of uniform traffic regulations was one of the most important problems facing the highway engineer today. "I would call your attention to the fact that it is the speed above fifteen miles per hour in moderate weight vehicles which does the damage to our light-surfaced roads," said the commissioner, who also expressed the opinion that fast-moving motor trucks would soon destroy not only the light but the heavy surfaced roads.

Commissioner Coleman declared that in order for the state to meet the necessities required by the Federal appropriation acts and to provide funds for resurfacing and reconstructing roads which are rapidly going to pieces we must have a special state road tax of not less than 1½ mills, or 15 cents on the $100, the tax to apply to all properties subject to state tax. This, based on the three-tenths mill tax, would yield $1,875,000, which amount, together with present Federal aid and convict labor, would amount to approximately $3,000,000; but there is every indication that Federal aid will be materially increased in the near future. With this increase we would have approximately $4,000,000 annually for highway construction.

R. B. Allport, of the Richmond Automobile Club, explained the attitude of the automobile owners toward highway improvement in Virginia.

On Wednesday morning "A State Bond Issue for Construction of the Highway System" was discussed by Roswell Page, second auditor. D. B. Ryland, manager, Lynchburg Chamber of Commerce, discussed "Should the State Tax for Construction of the Highway System Be Increased?"

In the afternoon "Health and Good Roads" was the subject of H. D. Griffiths, assistant epidemiologist, U. S. Public Health Service. Jesse C. Jones, director of co-operative extension work, State Department of Agriculture, spoke on the "Rural Motor Express." "Proper Regulations for the Use of Improved Highways" was discussed by W. S. Fallis, chief engineer of the North Carolina state highway commission.

The following papers were read on Thursday: "Prospects for Increased Federal Appropriations for Highway Improvement," by E. W. Saunders, member of Congress; "Methods and Cost of Construction to Withstand Modern Traffic," by Captain P. St. J. Wilson, chief engineer, U. S. Office of Public Roads; "Maintenance of Earth Roads," by S. L. von Gemminger, engineer of construction and maintenance, Virginia state highway commission.

PERSONALS

Bowe, Capt. Thos. F., Q. M. C., Construction Division, U. S. A., has been appointed chief of engineers, Port Utilities Office, Newport News, Va.

McInerney, Thomas D., recently of the engineering staff of the ordnance department, U. S. A., has opened an office for the practice of civil, mechanical and electrical engineering at 99 Chauncy street, Boston, Mass.

Hickok, Capt. C. E., until Jan. 1 attached to the office of the Chief of Engineers, U. S. A., Washington, D. C., has returned to his former position as city engineer of Alameda, Cal.

Starr, Ronald G., of Toronto, has been appointed engineer of the Orillia, Ont., electrical and waterworks plants, succeeding the late W. K. Greenwood.

Routly, H. T., head of the Routly Construction Co., Toronto, has been appointed by the Ontario Government construction engineer for the Provincial Highway, of which one hundred miles will be built this season.

Williams, A. D., chairman of the West Virginia State Roads Commission, has resigned in order to devote more attention to his personal business. Major C. P. Fourtney has been appointed to succeed him. He has had extensive experience in highway construction, in this country and in the Canal Zone at Panama.

Municipal Journal

Volume XLVI NEW YORK, FEBRUARY 22, 1919 No. 8

THE PAVING OUTLOOK FOR 1919

Reports by Paving Officials in All Sections of the Country, Giving Their Opinions on the Subject as Formed During the Past Two Weeks—Effect of War on 1918 Paving and Present Prices.

Perhaps the greatest interest of engineers and other municipal officials connected with the paving departments of the various cities of the country is centered at this time more in the outlook for paving work in 1919 and the prices that will obtain for materials and labor throughout the country, than in any technical questions, such as types of pavements or methods of construction. In a number of cases an important factor in determining the amount of paving that will be done will be the raising of funds to pay for the same. The question of finances is considered in another article of this issue.

In order to obtain as reliable information as possible concerning the prospects for paving work in the various parts of the country, Municipal Journal has asked a number of engineers in the various sections to submit such facts and figures as they could furnish and such opinions as to future prospects as they were willing to give. From a few sections it was found difficult to obtain the desired information, but that which we present herewith will give a very good idea of the conditions over the entire country as they appear to paving officials who keep themselves informed concerning these matters.

In asking for this information we requested the writers to describe the general condition as to paving during the year 1918, the prospects for work for the year 1919, and the prices for sand, gravel and other local materials and for labor that would probably obtain in their section of the country; suggesting that the judgments as to future work and prices might be expressed as relative to normal conditions immediately before the war.

Data furnished by the different writers as indicating conditions in their sections, and one or two additional sectional reports which are on the way but will not be received in time for this issue, will be published next week. The subject is discussed editorially on page 161.

STATE OF WASHINGTON.

Concerning the State of Washington and the adjoining states of Oregon and Idaho, Alfred D. Butler, city engineer of Spokane, writes:

"In the late summer and early fall of 1918 the War Department interposed a number of restrictions on making public improvements, restricting the amount of bond issue and only permitting certain very necessary improvements to be made.

"This had a very depressing influence on the disposition of the public to make improvements, as it looked, during the fall of 1918, as though it would be impossible to make any improvements at all during this year. The mind of the public, so far as I am able to interpret it, has not readjusted itself to the conditions as they now exist. The transition was so sudden, from the desire on the part of the government to have no work inaugurated, to the present desire to have all work possible inaugurated, that the public has not yet been able to adjust itself.

"Spokane is the center of a large agricultural and mining district. The farming districts have been especially prosperous during the past few years and I believe for the year 1919 there will be from twenty-five to seventy-five per cent more improvement work done than in the year 1918. This will consist in street improvement work and sewerage work in the small country towns, and the paving of highways in the farming region.

"In questioning the state highway engineer, I find that in his department there will be nearly 100 per cent more work done this year than was done last year in that department.

"I feel that the improvement work that will be done in the larger cities will not be more and may be less than that done in 1918. The indications are, however, that a number of improvements may be inaugurated in the latter part of this year, but not in time for the work to be done during 1919."

UTAH, WYOMING AND COLORADO.

The following report on these states has been furnished by Sylvestes Q. Cannon, city engineer of Salt Lake City:

"In the states of Utah, Colorado and Wyoming the improvement of state roads by hard surface paving has only been begun in the last few years, and it has only recently come to be generally recognized that these hard surface pavements on main roads are very important to the communities they serve.

"There has been, therefore, a general increase from year to year in the extent of these pavements laid, notwithstanding the war conditions. Information obtained from the State Highway Departments of these states show that approximately 20 miles of such pavements, approximately 18 feet in width, at a cost of about $19,000 per mile, were laid during the last year. This is generally equal to, or in excess of, work done in previous years.

"In Wyoming no pavement was laid prior to 1918. A comparison of unit costs for this work for 1916 and 1918 shows an increase of about 30 per cent for last year. In the matter of materials the increase of cost varied from about 15 per cent in Utah to 40 per cent in Colorado, and the labor cost from 50 per cent in the former to 40 per cent in the latter.

"As to proposed work for 1919 the prospects are for a large increase of pavements, amounting to about 133 miles in all, at an estimated cost of $2,700,000. The increase in Colorado is estimated at three times the amount done in 1918, Wyoming about eight times and Utah about eleven times. If the plans of the State Highway Department of this state are carried through there will be practically ninety-eight miles of pavement laid. The

cost of materials and labor will probably average about the same during this year as last.

"In the cities of these various states there is considerable variance with reference to the amount of work done and the amount proposed to be done. In Wyoming none of the cities propose permanent pavements. In Colorado, with the exception of Denver and Pueblo, practically no work is proposed for this year and none was carried through last year. In Utah the four largest cities—Salt Lake, Ogden, Logan and Provo—laid, all told, 82,000 square yards of pavement, varying from about 18 feet in width to about 40 feet in width. This exceeds the amount laid in normal years in all of the cities except Salt Lake by about 40 per cent. In this city the pavements laid last year were very much less than in normal years. In fact no new contracts were let last year for paving. The only work done was that carried over from the previous year.

"In the matter of cost it appears that in Salt Lake and Ogden the cost of work done was about as low as in normal years. In the other cities of Utah and Colorado it was about 30 to 40 per cent greater. Materials showed an increase in 1918 of about 25 per cent over normal years and labor about 50 per cent increase.

"The estimated cost of work for 1919 will probably average about the same as, or slightly lower than, 1918. This will be due doubtless to the large number of men returning from army service and to the reduction in the number of employes by various industries due to stoppage of war production. The cities of Colorado indicate, with one or two exceptions, that very little work will be done.

"The cities of this state contemplate a large increase in the amount of pavement to be laid, contingent upon the approval of bond issues by the voters. Salt Lake City is at the present time preparing for a bond election in the sum of two million dollars for various improvements, including about 15½ miles of pavements. The issuance of this amount of bonds will mean the expenditure of approximately 1½ million dollars more, which will be paid by local assessment of property benefited. Salt Lake County is also preparing for a bond election in the sum of 1½ million dollars, which will be used chiefly for hard surface pavements, including, however, some scenic highways to be constructed in the Wasatch mountains. Ogden is preparing for a bond election of several hundred thousand dollars, of which approximately $260,000 will be spent for pavements. The State of Utah also contemplates the issuance of bonds to cover a portion of the cost of the proposed road paving mentioned in the beginning of this article.

"Labor conditions at the present time indicate that unless municipal and state improvements are undertaken promptly and in large measure there will be a great many unemployed. Private corporations are apparently holding back with improvements because of the high prices prevailing.

"The general sentiment throughout the cities and the state appears to be favorable to the issuance of bonds for these necessary improvements."

NEBRASKA, IOWA AND KANSAS.

For the report in and around Nebraska, including Iowa and Kansas, we have obtained the following statement from John A. Bruce, city engineer of Omaha:

"The year 1915 was, in my judgment, what might be considered a normal year for the states under consideration so far as yardage of pavement construction is concerned. During the years 1916 and 1917, a gradual decline was very noticeable. During 1918, taking into consideration only work that was contracted for and completed within the year, the amount will undoubtedly run considerably less than ten per cent of the volume of 1915. In the three states, Iowa's percentage was, from information available, the lowest, followed by Kansas second, and Nebraska the highest. The fact that Nebraska's percentage was higher than that of either of the other two states is due to the unusual volume of work done in Omaha as compared with other cities, this volume being about 70 per cent of the total street paving of 1915. There was practically no paving done in the smaller towns of Nebraska during the year, while the work done in Iowa and Kansas was more uniformly scattered over the states as a whole. In all three states several contracts let in 1917 were completed in 1918; but even with these added to the contracts let and completed during the year, the total would not go beyond ten per cent of 1915 in the states of Kansas and Iowa, and would probably run up to 15 per cent in Nebraska.

"The reasons for the curtailment of the paving program in the three states in question were: first, the increase in unit prices due, of course, to the increased cost of material and labor and the difficulties of obtaining either at almost any price; and second, the prevailing desire on the part of all communities to assist the government in its war program, by releasing labor for use in connection with strictly war activities and saving the money that would otherwise be invested in public improvements, for investment in bonds and other government securities.

"In Iowa, a uniformly increasing yardage of pavements in municipalities was constructed, including 1915, and with the organization of the present Iowa State Highway Commission in 1913, a great impetus has been given the improvement of highways in rural communities. A state highway program is now under consideration involving the expenditure of $100,000,000, largely hard-surface construction, covering a seven-year period. This does not include proposed pavements in municipalities which, from reliable news, will probably double the yardage laid in 1915 if present plans mature. However, my personal opinion is that 50 per cent of the work proposed in municipalities in Iowa will go by default as soon as bids are opened, due to high prices, but as I am convinced that only slight reductions in prices can be expected in the next few years, and that the public at large will shortly realize this, I am of the opinion that paving programs will be formulated and carried out on an increasing scale with a possible duplication of 1915 yardage during the present year.

"Kansas, having more industrial activities, has a larger number of towns of a population of 1,000 or more than Nebraska has, and being an older state, took up the question of hard-surface treatment of its streets at an earlier date. As a consequence, the yardage of pavement laid in 1915 was considerably more in Kansas than in Nebraska. During the present year, Kansas is competing in its highway and paving program with Iowa, but with a less likelihood of carrying out its program to completion in the same length of time. This is due partly to the fact that Iowa is a richer state than Kansas and also to the fact that material costs in Kansas for hard-surface pavement are, in general, higher and transportation facilities not so good.

"In Nebraska, outside of the cities of Omaha and Lincoln, practically no paving was done prior to the year 1900. Very little work was done from that year until 1910, so that practically all the paving done outside of the two cities of Lincoln and Omaha has been done in the last eight years. From reports of activities in the

various towns in the state, even making allowance for the fact that probably 50 per cent of the work now contemplated will 'fall by the way side,' I would estimate that there will be twice as much paving done in Nebraska this year as there was in 1915.

"As to the Nebraska highway program for the present year, I would estimate that a comparatively small yardage of hard-surface roads will be constructed, due to the fact that the necessary preliminary grading has to be done first, together with the construction of permanent and adequate water ways.

"Douglas county, in which Omaha is situated, contemplates a program which will involve the expenditure of three million dollars, which will possibly stretch over a period of three years. I do not anticipate any appreciable amount of this work will be started during the present construction season owing to the necessity of securing special legislation for this purpose and the issuing and selling of the bonds.

"In my judgment, the outlook in the three states under consideration is very favorable with reference to a resumption of paving activities on a larger than pre-war scale; and I am not unduly optimistic in making the statement that the Middle Western States, on account of improvement activities of this nature in the next five years, will force admiration and amazement into the hearts of the sister states bounded by the Atlantic Ocean and the Mason and Dixon Line, who are still not absolutely certain but that the Indians are roaming wild over the water sheds drained by the Missouri river and its tributaries."

TEXAS, OKLAHOMA, ARIZONA AND NEW MEXICO.

The city engineer of Fort Worth, Texas, F. J. Von Zuben, sends data from twenty-four cities in the above states, which are summarized below. Mr. Von Zuben says: "The war, while it temporarily held up improvements here, was the occasion of bringing many men to Texas and Oklahoma from other parts of the country, and the prospects for the early development of this portion of the country are promising, as a consequence. Many cities have not as yet completed their plans, however."

Dealers in paving materials who were consulted by Mr. Von Zuben informed him that in Arizona and New Mexico there were prospects of work in only two cities in each state, and of these the only one that reported any decision as yet was Albuquerque.

The cities reporting that they had decided upon paving for this year were: in Texas, Fort Worth, Beaumont, Bryan, Cleburne, Corpus Christi, El Paso, Houston, Mineral Wells, Port Arthur, San Angelo, Texarkana and Wichita Falls. In Oklahoma, Ada, Ardmore, Anadarko, Bartlesville, Eufala, Dewey, Ft. Sill, Lawton, Pauls Valley, Ponca City and Sapulpa.

Summarizing the reports, the Texas cities did 584,700 sq. yds. in 1917; 294,492 sq. yds. in 1918, and are planning 502,000 sq. yds. for 1919. (Four have not yet made their plans.)

The Oklahoma cities did 212,638 sq. yds. in 1918 and have planned 311,285 sq. yds. for 1919, the latter being reported by nine cities, the other two not having made plans yet.

In Arizona, Phoenix paved 34,918 sq. yds. in 1917; 65,722 in 1918, but has not decided upon this year's plan.

In New Mexico, Albuquerque plans 120,000 sq. yds. of paving this year.

In the matter of cost of materials, in Fort Worth crushed stone sold for $2.50 and $3.00 respectively in 1917 and 1918 and is now selling at from $2.50 to $3.00 per cubic yard. The prices for gravel for 1917, 1918 and 1919 are $1.50 per cu. yd., $1.90, and $2.00. Sand, $1.50 per cu. yd., $2.00 and $2.25. Labor, per hour, 25 cts., 30 cts., and 35 to 37½ cts. Other Texas cities report 1919 prices for materials as 15 to 100 per cent higher than in 1917, and labor 25 to 100 per cent increase, averaging about 70 per cent. In Oklahoma, Ardmore reports prices of materials advanced about 20 per cent and labor 35 per cent from 1917 prices, while Bartlesville reports the increase as 75 per cent and 100 per cent respectively.

INDIANA AND ILLINOIS.

From an Illinois engineer of long and wide experience in paving matters, who asked that his name be not used, we have received a report concerning municipal and state highway conditions in Illinois and the adjacent sections. He reports that nearly all of the cities in Illinois are in a condition of uncertainty, as is also the state highway department. Prices are so high and labor has been so scarce that it seems to most city officials to be the better part of valor to wait until matters have settled somewhat. Springfield is one of several cities, however, which is considering a large amount of work. Last year that city prepared an ambitious program for paving down-town streets and prepared the plans for it, but later the embargoes prevented starting the work. The plans are completed for several miles of repaving in this city, a large part of which will probably be wood block.

Sangamon county voted some time ago a bond issue of $2,000,000 for good roads, which has not been spent and which it hopes to spend this year, the county receiving, under a provision of the state law, a refund from the state at such future time as may find the money available in the state treasury. Lincoln, Decatur, Chicago, Cook county, and Vermillion county have uncompleted contracts let two years ago which they hope to renew work on this spring. Most cities and counties appear ready to help in the state work, to build city streets to meet the state roads at the city limits, but do not seem to be considering much else in the paving line.

As to state highway work, high prices and the question of the ability of the state to sell the bonds voted in November at the required prices are offset by the necessities of finding employment for war workers and returning soldiers. Also there is a question whether there will be contractors enough to do the work which is in prospect. The state and counties have on hand an unexpended balance of about $2,000,000 for construction of roads under the state aid plan by which half of the cost is paid by the state and half by the counties. Five definitely located federal aid roads are to be built with funds from the state, the national treasury and the counties, of which nearly $10,000,000 is now on hand or will be by the time the money can be spent. About $4,500,000 of this will be available by July of this year from the state and federal governments, and half of this amount in addition from the counties through which the roads pass. There is therefore something like $12,000,000 on hand or available before July, 1920, which can be spent before the state bond issue is actually realized on. A friendly suit is now in the courts to test the validity of the bond issue law and vote, and until this is decided there will evidently be no attempt to sell any part of the $60,000,000 of bonds.

In general there is no lack of money and the only question is as to the advisability of letting contracts at present prices. The question of whether to pay present prices or to wait for a break in prices, and that of whether to start work so as to give employment to those who are beginning to need it, or to hold back on lettings until wages come down, must evidently be decided by public opinion, which has not yet had sufficiently strong and

definite expression to warrant a decision. Most students of the past believe that it will be nearer ten years than one year before prices and wages return to approximately their former level.

Bids were received last fall on a number of sections of the Dixie and Lincoln highways, both federal aid roads, but they were so high that all bids were rejected. The state built some of the roads covered by these bids last fall at a cost less than either bids or estimates. These sections are now ready for letting at an early date and a call for bids is expected soon.

Indiana has obtained a favorable decision as to the validity of its state highway commission law, which will enable it to spend some money on federal aid roads and some of the main lines of its state system.

Inquiry at the January 30th meeting of the Illinois Engineering Society developed that engineers, contractors and material men generally believed that no considerable amount of work would be undertaken before a drop in the price of materials, although not much complaint was made regarding wages, the hope being expressed that more competent labor can now be obtained and thus much better results for the same prices than were possible last year. The most serious deterrent was considered to be the increase of a third in freight rates on construction materials and especially the adoption without modification of the ton-mile freight schedule.

MICHIGAN AND WISCONSIN.

Conditions in Michigan and Wisconsin are reported upon by A. Lenderink, city engineer of Kalamazoo, whose report is as follows:

"A survey of the amount of paving and other municipal construction in the cities and towns of Michigan and Wisconsin during the past year shows a drop below normal between 25 and 95 per cent for the year 1918. In the smaller cities and towns paving was practically suspended because of the increased cost of labor and materials, and the inability to obtain help even where contracts were awarded in the fall of 1917.

"There was a feeling in most cities and towns that all municipal work that could be postponed should go over during the period of the war. In a number of cities, contractors who started work in 1917 were unable to finish their work that season, because they could not compete with wages paid at government cantonments and factories in cities doing war work. The completion of these contracts or work in 1918 was all that was done.

"For the larger cities in the two states, the average amount of paving was about 35 per cent of normal. Milwaukee did about 75 per cent, and Saginaw only about 5 per cent. The increase in cost of labor ran from 30 to 60 per cent, and the increase in cost of materials from 25 to 85 per cent. The average increase for both is about 50 per cent.

"For the coming season there is a spirit of uncertainty in the smaller places because of the present high cost of materials. The officials are waiting to see if prices will not decline. In the larger places, especially where the factories held war contracts, there is an abundance of labor. In an effort to keep these men employed, and because of the amount of work that has been postponed for the past two years, the cities are planning a full paving program. The officials in the cities feel that the best interests of the community can be served by going ahead even at increased costs. Municipal construction offers an outlet for the excess labor during the period of re-construction. Flint probably has the largest paving program outlined of any city in Michigan outside of Detroit.

"The question of sale of improvement bonds at this time may make some cities cancel part of their program.

"The Michigan Good Roads Association is arranging an extensive program for good roads in the state, and for a memorial paved highway across the lower part of the state from Saginaw and Port Huron through Lansing, Battle Creek and Kalamazoo to Lake Michigan and Chicago."

MISSOURI AND ILLINOIS.

The report on Missouri and Illinois was furnished by C. M. Talbert, director of the Department of Streets and Sewers of St. Louis. In addition to his general statement, Mr. Talbert sends reports from the city engineers of Joplin, Kansas City, St. Joseph, Sedalia and Springfield, Mo., and Joliet, Ill. Mr. Talbert also got in touch with contractors who are interested in road work throughout the State of Missouri.

In St. Louis conditions are such that the officials believe that they should place on the market at the earliest possible moment a sufficient amount of work to justify contractors in organizing their forces for a full season's work, and material men in opening up their plants on the same basis. Bids are to be opened in March for about $525,000 worth of street construction and reconstruction, $26,000 of alley construction, and $6,000 worth of sidewalk construction, or a total of $560,000. Missouri has outlined a policy, which has the approval of the governor, for a bond issue greater than that voted by Illinois—$60,000,000—but it is certain that this amount, under the most favorable circumstances, will not become available until next year, and it is doubtful if the Illinois money can be spent during this working season. Without receiving a direct report from Illinois, it is his impression that there will be a revival of street and road work in both these states, the amount depending largely upon the prices of material and labor. It is also his impression that the prices of materials must depend entirely upon the amount of work let.

"There seems to be a general tendency on the part of those in responsible charge of work to feel that it is a duty on their part to start, as soon as possible, all character of paving and road work, to the end that as much labor as possible may be utilized.

"If I may state in a word my general conclusion, it would be that the entire tendency is toward a considerable revival of this character of work throughout the two states this year and a still greater amount next year."

From the reports obtained by Mr. Talbert from city engineers the following statements as to work proposed for 1919 are obtained: Joplin, Mo., will pave several streets with concrete, expecting to pay about 23 per cent more than in 1918 and about 30 per cent higher than in 1917.

Kansas City expects to spend about $8,000,000, including sewers and bridges as well as paving. The paving work will not be confined to any particular kind of material. The amount of work is expected to be about five times as great as last year. No estimate is made as to prices.

St. Joseph has mapped out a program, but no definite action has yet been taken. Last year about 0.3 of a mile of pavement was constructed, but this year there will probably be 10 miles in addition to oiling 6 or 8 miles of macadam. It is anticipated that the prices will be at least 100 per cent greater than in 1917.

Sedalia received bids on the 17th for 23,000 square yards of brick pavement, which was about ten times as much as was laid in 1918 and 40 per cent more than in 1917. Prices this year are 30 to 40 per cent above those for 1917.

Springfield has prepared a sewerage program, but none yet on paving. What paving is done will probably be with brick for heavy traffic and Topeka macadam for residence streets. The amount of street work this year will probably be 25 per cent greater than last year and the prices 75 per cent higher than in 1917.

Joliet, Illinois, intends to spend about $250,000 in street paving, about half brick and half asphaltic concrete. Prices for the former are 25 per cent higher than in 1917 and those for the latter 10 per cent higher.

ALABAMA.

The city engineer of Birmingham, Ala., Julian Kendrick, did not wish to make any general statement for the states of Georgia, Alabama and Mississippi, but the considerable area known as the "Birmingham district" is such an important part of this section of the country that his report for that district may perhaps be considered as typical of conditions throughout the states named. He reports that in his opinion not more than ten per cent of the average annual amount of improvements was made during 1918 which originated during that year, although quite a little work was done that originated during 1917 and some of it even as far back as 1916, the starting or completion of which had been more or less delayed owing to inability to secure prompt delivery of materials.

"Of course the foregoing does not apply to cities or towns, or even counties, in or near which cantonments or war enterprises were located, which created the necessity in many instances for the construction of either pavements, sewers or water works extensions, the financing of which, and the delivery of material, received Government aid or encouragement.

"In the case of Birmingham the only work undertaken during 1918, the ordinances for which were adopted that year, consisted of a few lateral sanitary sewers as a health measure and a few blocks of macadamized streets, which had been agitated for some time previous. However, there was a considerable amount of street paving completed during 1918 which had been begun and should have been completed in 1917 but for unavoidable delays incident to the war.

"This city has contracts outstanding for over two miles of street paving which was let in 1916, the starting of work on which was delayed by the inability of the Street Railway Company to secure prompt delivery of rails and special work. When this material was finally delivered the Street Railway Company began its track work, but later was forced to abandon it, since the Government would not approve the securities which it was necessary to issue in order to carry on the work. In the meanwhile the price of labor has increased from $1.40 to $3.30 per day and the price of cement from $1.60 to $2.60 per barrel, and other material to a greater or less extent. It is obvious that it would be unjust to require the contractor to complete the work at its original price; at the same time property owners who would be assessed for the cost of this construction claim that the city should have arranged to have the contract executed promptly and that they are unwilling to pay the additional cost. The matter has been under discussion for some time, without any definite conclusion being reached.

"As regards future work, under normal conditions there would be more to do than it would be possible to complete during the year of 1919. However, owing to the unsettled conditions in the price of labor and material, little or no work is being let to contract, and practically no petitions are being filed by property owners for public improvements.

"I believe that if it were definitely known that the price of labor and material would remain fixed during the next twelve months much work would be proceeded with; but owing to the uncertainty of future prices, property owners who will have to pay the cost of the work are hesitating, fearing that they will have to pay more than their neighbors who delay filing their petitions."

WESTERN PENNSYLVANIA.

Conditions in Western Pennsylvania and vicinity are described by Nathan Schein, division engineer, Department of Public Works, Pittsburgh, Pa., as follows:

"Among the many problems confronting the nation at this time, the immediate provision of employment for returning soldiers and workmen dismissed from war industries appears to be one of the most important. Perhaps the largest source of such prospective employment is to be found in the construction of public works, as roads, bridges, buildings, etc.

"Since the advent of the United States into the great World War, there followed a train of events which produced a very marked decline in public work and building construction in this section, as throughout the country, but now a very bright future prospect for such work is in store. Although since 1914 the price of labor and materials have steadily advanced, yet in the latter half of 1916 the material and labor operations were the heaviest in the history of the country. The demand for highway improvements continued to increase until in 1917 the paving program of the city of Pittsburgh was far above that of the average year, although a marked decline in building construction was experienced throughout the country.

"In the year 1917 a shortage of labor was experienced in municipal and highway work. Materials became scarce and naturally very costly, and all conditions were much adverse to any great activity in public work or highway work. In the latter part of 1917 there began regulations which affected materially all public works, and from that time until the signing of the armistice paving work by municipalities and states was on a great decline. In the month of July, 1918, the War Industries Board still further curtailed street improvements by issuing an order to the effect that priority assistance would be withheld on all new construction work not essential to and not contributing either directly or indirectly toward winning the war. Later in September an approved permit had to be obtained from the United States Highway Council before any highway work could be started. This procedure consumed much time, and as a result very little paving work was done during the year. The city of Pittsburgh finished about fifty per cent of its contemplated highway work during 1918.

"By the signing of the armistice the government restrictions on public improvements were immediately removed, and it now appears that highway and other construction work will be resumed with renewed vigor. There are great demands for such work, especially since the advent of the motor-driven vehicles. Petitions for improving roads and streets are growing rapidly in number. There is already a surplus of labor and material which are so advantageous for just such work. The people of the State of Pennsylvania have already voted a bond issue of $50,000,000 to be expended on highway work in the next few years. The city of Pittsburgh is contemplating a people's bond issue of perhaps $12,000,000 for public improvements, of which sum more than $8,000,000 is to be expended on street improvements. This, in addition to the ordinary contemplated yearly expenditure for highway improvements of the various cities, towns, boroughs and surrounding territory,

promises the greatest activity in street and highway construction work for several years that the people of Western Pennsylvania ever witnessed."

In general comment he states that it "appears now" (on February 8th) "that prices will come down to some extent, but will of course be higher than prices before the war. There is a strong feeling everywhere that large paving work will be undertaken in this district, and the city of Pittsburgh is in good shape financially to undertake this work." From N. S. Sprague, chief engineer of the department, we learn that the city expects to submit to the people for a referendum vote a bond issue for various public improvements aggregating $12,000,000, of which $6,830,000 is for street improvements, $550,000 for highway bridges, $500,000 for resurfacing roadways and other improvements in the park system and $1,000,000 for street repaving.

NEW YORK, NEW JERSEY AND PENNSYLVANIA.

A very complete report on these states would have been presented, prepared by William A. Howell, engineer in charge of streets of Newark, N. J., had not Mr. Howell a few days ago been incapacitated from completing his report by an attack of influenza. A large amount of data has been collected by him and will probably be published in detail in a week or two. We hope also that Mr. Howell will within that time be able to prepare his formal report. In the meantime we submit statements made by him in a letter accompanying the statistics which he sent, together with a few figures and summaries:

"Many replies that were received absolutely ignored the forecast for 1919. I have, however, received a goodly number of forecasts, and the tone of optimism is so strong and insistent that I constrained to conclude that in this district 1919 is going to be a good year—probably 50 per cent better than 1915 or 1916, for instance. There are local conditions in a number of cities (my own, for instance), such as an abnormally large tax rate that will alarm the tax-payers to such an extent as to materially affect local improvements. However, improvements are needed almost everywhere, labor promises to be plentiful, materials (except in a few instances) will not be higher than during 1918, and the only thing lacking to start things moving is a little confidence. Taken as a whole, there is a general feeling that necessary work has been restricted during the past two or three years and immediate measures must be taken by progressive municipalities to regain the ground lost by inactivity of road work during the war."

In commenting upon the figures of paving done in 1918 as compared with previous years, Mr. Howell wisely suggests that if a careful analysis be not made of the figures a misapprehension or misunderstanding of the true paving conditions is probable. For instance, Newark did considerable work in 1918, but 95 per cent of it had been contracted for in 1916 and 1917, and similar conditions existed in many and possibly most other cities. He suggests going back at least to 1914 in selecting a year of normal paving. As an illustration, Passaic, N. J., reported the amounts spent for paving during years 1913 to 1918 inclusive to have been as follows: $101,770, $127,760, $93,966, $50,091, $84,319, $63,036. It is considered probable that the expenditure for 1919 will be $100,000. In Brooklyn, N. Y., sheet asphalt (which constitutes by far the largest amount of paving) was laid as follows, the figures being square yards for the years 1913 to 1918 inclusive: 991,464, 702,135, 393,827, 418,569, 476,745, 94,650. The average for the six years was 512,898. (No forecast for 1919.)

In the matter of prices, in Newark the cost of sand per cubic yard during the last six years was $1.25 up to 1918, when it jumped to $2.15; stone was $1.85 for the first five years and $2.85 in 1918. Cement prices were $1.85, $1.70, $1.65, $2.05, $2.60 and $3.35. Mr. Howell believes that the prices in 1919 will be practically the same as last year. In Reading, Pa., sand cost $1.05 in 1915, $1.44 in 1917 and $2.25 in 1918. Broken limestone was a minimum of $1.07 and maximum of $1.83 in 1918. Asphalt per ton f. o. b. Reading advanced from $22.45 in 1917 to $35 in 1918. Paving brick (buff) per thousand f. o. b. Reading cost $25.65 in 1913 and 1914, $26.50 in 1916 and $34.50 in 1918. Labor on highway maintenance cost 25 cents per hour during the first four years, 27½ cents in 1917 and 30 cents in 1918, while pavers' wages advanced from 31¼ cents to 35 cents in 1917 and 40 cents in 1918. In Brooklyn the cost of laying sheet asphalt on a 16-inch concrete foundation during the six years in question was as follows: $1.984, $1.790, $1.414, $2.075, $2.346 and $2.343. Granite was $3.996 in 1913 and again in 1916, $4.194 in 1917 and $4.210 in 1918.

Among the reports of paving proposed for 1919 in the cities of this section are the following: Montclair, N. J., 60,000 sq. yds. penetration resurfacing; 30,000 sq. yds. reshaping and surface treatment, and 70,000 sq. yds. of patching and surface treatment with tarvia or asphalt oil. Jersey City, N. J., granite blocks, new base, 62,755 sq. yds. and on old base, 23,300 sq. yds.; sheet asphalt, new base, 36,990 sq. yds.; old stone pavement, 3,850 sq. yds.; wood block, 8,880 sq. yds.; repairing belgian block, 9,400 sq. yds. Newark, N. J., about $500,000 worth of work. Elizabeth, N. J., $620,000 worth of work (nearly four times as much as any year since 1913, when $261,000 was spent). New Jersey State Highway Commission, about 100 miles, 50 of which is left over from the 1918 program, the amount to be spent this year approximating five and a half million dollars.

In New York State, Yonkers proposes 8,605 sq. yds. Richmond Borough, New York, $300,000; Bronx Borough, "a materially larger amount than in 1918." Utica, $200,000. Albany, $136,000. Troy, 25 per cent to 33 per cent more than in normal years; "our expectation is based on the necessity of catching up with the program adopted prior to the war as well as providing profitable employment for idle labor."

STATISTICS FROM CITIES.

The city engineers of about three hundred cities have kindly furnished us with information as to the amount of pavement of each kind that should be constructed, resurfaced or repaired in their respective cities this year; together with other information, part of which is published elsewhere in this issue and the remainder of which will appear in later issues. The figures referred to we have summarized and totaled by districts, which figures are given below. The figures all represent square yards, the first figures in each case being the amount of work that should be done, the second figure (if any) representing the amount that probably will be done. In the questions submitted to the engineers, new construction was defined as including everything from subgrade up, including base where such was used. Resurfacing is renewing the entire wearing surface on the old base, where a concrete base is used, or placing new material over the entire area of the pavement when there is no concrete base. Repairing is replacing less than the entire area of wearing surface. Bituminous concrete is defined as "a pavement composed of stone, gravel, shell or slag, or combinations thereof, and bituminous materials, incorporated together by mixing methods"; while bituminous

macadam is defined as "a wearing course of macadam with the interstices filled by penetration methods with a bituminous binder."

New England States.

Sheet asphalt construction, 8,000; resurfacing, 16,000, 8,500.

Stone block construction, 83,000, 83,000; repairs, 10,000, 10,000.

Wood block construction, 2,900.

Bituminous concrete construction, 50,000, 28,000

Bituminous macadam construction, 164,500, 155,900; resurfacing, 25,000, 5,000.

Waterbound macadam construction, 27,000, 27,000; resurfacing, 17,000, 5,000; repairs, 8,800, 8,800.

Gravel construction, 90,600, 90,600; repairs, 17,600, 17,600.

Concrete construction, 232,300, 90,000.

Middle Atlantic States.

Sheet asphalt construction, 715,900, 605,000; resurfacing, 393,800, 285,800; repairs, 471,000, 450,000.

Brick construction, 582,600, 293,200; resurfacing, 95,300, 35,200; repairs, 149,400, 40,400.

Stone block construction, 315,800, 280,400; resurfacing, 4,700; repairs, 10,000, 9,000.

Wood block construction, 86,400, 51,400; repairs, 61,000, 51,000.

Bituminous concrete construction, 58,100, 5,000; resurfacing, 283,500, 185,000; repairs, 105,000, 80,000.

Bitulithic construction, 32,300, 30,800.

Bituminous macadam construction, 108,900, 78,900; resurfacing, 558,500, 443,100; repairs, 72,600, 35,600.

Waterbound macadam construction, 63,000, 15,000; resurfacing, 45,000, 35,000; repairs, 27,200, 27,200.

Gravel construction, 50,000, 48,000; resurfacing, 20,000; repairs, 14,200, 12,000.

Concrete construction, 184,400, 167,000; resurfacing, 6,000.

Miscellaneous pavements, 21,500, 8,000.

South Atlantic States.

Sheet asphalt construction, 35,000; resurfacing, 94,000, 94,000; repairing, 2,000.

Brick construction, 36,000; resurfacing, 15,000.

Stone block construction, 10,000, 10,000.

Wood block construction, 20,000, 20,000; repairs 20,000, 20,000.

(To be continued.)

THE MANUFACTURERS' AND THE CONTRACTORS' POINT OF VIEW.

By MAURICE B. GREENOUGH.*

The manufacturer of paving material shares the belief of all who are engaged in highway and street improvement that an unprecedented era of construction is before the country. Never before has the issue been so clean-cut as now. Experience during the war proved conclusively to the country that its transportation facilities are hopelessly inadequate either to expand in sudden emergencies or to keep pace with the increase in transportation demand that will accompany the coming industrial activity, without the addition of roads suitable for commercial transportation.

Already the significance of a lesson learned is being manifested by large bond issues for state road systems that have passed either the preliminary stages of approval at the polls or which are being prepared for that step. Activity is most keen in those states that heretofore have not been noted as road building states. Among them, Illinois and Pennsylvania voters have approved bond issues of 60 and 50 million dollars respectively. The South Carolina Legislature is considering an issue of $25,000,000; the Georgia Legislature, one of $40,000,000, and a bill is nearly ready to go to the Tennessee Legislature calling for an issue of $50,000,000.

Other states that have been road builders for some time and have the necessary machinery in existence for raising funds, are becoming active. For example, Ohio hopes to have $7,500,000 available for 1919. Scarcely a day passes in which some new county bond issue is not proposed, most of them counties, like states, that before the war had done little or nothing in the way of systematic highway improvement.

The future, both immediate and more distant, is much more clearly defined in rural than in urban districts. In cities where unemployment is most manifest, public improvements are being urged as a means of taking up the slack of industrial employment during the reconstruction period. However, it is in the cities that the tendency to postpone work until prices shall have decreased is most seen.

The situation is an anomalous one, particularly from the manufacturer's point of view. He is confronted on the one hand with the necessity of employing labor at high prices and on the other with the manifest disposition of some, in fact many, city officials to counsel delay or lower estimates if the work is to be advertised immediately. The problem of the contractor is one with that of the manufacturer.

The position is not unreasonable for either manufacturer or contractor who assumes that if officials are looking to public improvements to solve the unemployment problems, then officials should permit the work to be estimated at prices that reflect the general opinion that wages for labor should not be materially lowered.

This statement bears no element of prophecy over the future of prices. Ultimately labor costs may fall; whether much or little, cannot be foretold at present; but if so, resources from which comes the money to pay for paving, likewise will be reduced. But assuming that they do fall, the lag between the cost of labor at the time of making paving materials for sale, or the time elapsing between filing bids and beginning work, will maintain high costs of paving work for some time yet.

Officials should therefore recognize the predicament of the manufacturer and contractor, and allow estimates that permit of ready sale of work. If readjustments are later to come, then both the manufacturer and contractor will be ready to readjust as they can without incurring the risk of serious financial loss.

On the other hand, some officials take the position that work should go forward regardless of cost. Such officials are those who see unemployment at first hand and realize the danger therein to community and public life. The governor of a large mid-western state recently urged every city, county and township to bond or tax itself to the limit, and push public improvements at going prices, rather than to risk the industrial unrest and its cost which would in all probability far exceed any petty saving made by haggling over a few cents per square yard at this time.

By gradual readjustment the price question may ultimately be solved to the satisfaction of all concerned, without impairing credits or business relations. Holding back, waiting for prices to fall, may mean that the whole economic structure of the country will fall with a crash, and between the two possibilities there can be no hesitation in choice.

*Assistant Secretary National Paving Brick Manufacturers' Association.

IMPROVING HILLSIDE STREETS.

Two-level Streets, Switchbacks and Sunken Roadways Used on San Francisco Streets in Mounting Steep Hill Sides.

An illustration of the use of a two-level street in solving a side-hill street problem is furnished by Leavenworth street, San Francisco, the treatment being shown by the illustration below, Fig. 1. The roadway on the left leading to the upper level swings around into Francisco street, giving access to a district above, which had been almost inaccessible, the only approach having been over a 20½ per cent grade paved with a very dilapidated cobblestone pavement. The construction shown consists of a retaining wall 187 feet long which divides Leavenworth street into two levels, the lower one having a ten-foot sidewalk and the upper one a six-foot sidewalk, while the lower roadway is 32 feet wide and the upper one 17½ feet. The grade from Chestnut street (in the foreground of the illustration) to the retaining wall and for 50 feet further on the lower roadway descends at a 15.9 per cent grade, changing to a 6.8 per cent at the lower crossing of Francisco street. The upper roadway ascends on a 3.4 per cent grade. The 15.9 per cent grade is paved with brick on a four-inch concrete base.

In addition to dividing Leavenworth street as shown, the retaining wall crosses Francisco and Leavenworth streets diagonally to the further curb of the former, and a stairway is built in the face of this wall leading from the left-hand sidewalk on Leavenworth street at the lower level (beyond the retaining wall) up to the upper level immediately above.

The wall is of reinforced concrete of the cantilever type surmounted with a 4¼-foot parapet. The wall is 31.25 feet high at the highest point and 5.75 feet high at the lowest, including base and parapet. It is twelve inches thick at the top and batters seven inches in five feet of depth, giving a maximum thickness at the base of 3.86 feet. To insure against undue settlement in backfilling behind the wall, special precautions were taken in tamping. The fill, which was placed by means of wheelbarrows, was water tamped, the weep-holes in the wall having been plugged temporarily to hold the water, and all the plugs were pulled simultaneously later on to insure a uniform settlement. The subgrade was rolled by

FIGS. 3 and 4—SWITCHBACK STREET IMPROVED BY RETAINING WALLS.

FIG. 1—RETAINING WALL SPLITS LEAVENWORTH STREET INTO UPPER AND LOWER LEVEL.

means of five-ton motor trucks first used empty and then loaded.

Grade is a more important matter in connection with roadways than with sidewalks. In the case shown in Figure 2, the street as originally built had a grade too steep for use by the street railway and objectionable for teams, and the railway made a detour. The city and the railway company shared the cost of remedying this by cutting down the roadway grade from 14.4 per cent to 10.9 per cent. The maximum depth of cut was 15 feet.

The sidewalks were not lowered, since this would have greatly depreciated the value of the buildings abutting on them as well as increased the cost. Instead, a retaining wall was built along each curb line, stairways at intervals connecting the sidewalk and roadway. Sewers and other public utility underground structures were placed under the sidewalk.

The street railway company did the excavating, totaling about 11,500 cubic yards, and the city paid $16,000 for the balance of the improvement.

Another improvement in hillside streets made at the expense of both city and railroad company is shown by Figures 3 and 4. Here the railway used a switchback (in the foreground) for ascending the hill. The track descending the hill occupied the entire width of the cut and was hardly practicable for vehicles. By slightly changing the track alignment and building retaining walls, the roadways were widened and the section made accessible for vehicles, and the appearance at this point was greatly improved.

FIG. 2—ROADWAY LOWERED WITHOUT LOWERING SIDEWALKS.
At three points on the right and one on the left of the roadway are seen steps from roadway to sidewalk, with guard railings.

ASSESSMENTS FOR STREET IMPROVEMENTS

Various Classes of Improvements and Services for Which Different Cities Assess the Cost, the Cities That Make Assessments for Each, and the Percentages of Cost Assessed.

Last week we gave a summary of the practices of all cities of more than 30,000 population in providing revenue by means of taxes of all kinds, together with a discussion of the possibilities of reducing municipal expenses. A practice that may be considered as being strictly neither raising of revenue nor reducing expenses is the direct assessing on benefited property of the cost of public improvements and services.

So far as spending money for public works and services is concerned, a government is merely an agency through which a community acts co-operatively in order to secure advantages that it could not secure by individual action. It may be that the very performance of the service necessarily involves joint action, such as constructing and operating a sewer system, or that by such action the service is secured at less cost and more effectively. Also the service may be of value chiefly to individual properties, such as the paving of residence streets; or may benefit the entire community, such as flood protection or a city hall.

The government acts also as the agent for collecting the funds for carrying on these public benefits. In most cities the larger part of the total expenses are treated as being for the common good, and the necessary funds are obtained by levying upon all citizens in amounts depending not upon the benefit that they individually derive from the services, but upon their property holdings or on some other basis.

A large percentage of cities, however, assume that certain public works or services, chiefly those having to do with the highways, are so largely of benefit to individuals whose property is adjacent thereto that they assess all, or a large part, of the cost directly upon such property. The money so collected may be considered as going not into the common pool, but directly from the party assessed to the one who constructs the utility or performs the service, the city acting as the agent for the individual (rather than for the community), whereby he secures the benefit at less cost and trouble and to his greater satisfaction than if each individually had contracted for the same.

The accompanying table shows to what extent each of the cities of more than 30,000 population makes direct assessment of cost of constructing the various classes of improvement connected with the street surface. (Assessment for other improvements will be considered in a later issue.) The data are obtained from the report of the U. S. Census Bureau and apply to the year 1917. The figures given therein may be summarized as follows:

In all, 219 cities are included in the list of those of more than 30,000 population. Of these, 55.7 per cent assess for opening streets, 41 per cent assessing the whole cost and the others a part of the cost only.

For grading streets, 57.1 per cent assess the abutting or benefited property, 38 per cent the entire cost and 19.1 per cent a part only.

For paving streets, 47.5 per cent assess all the cost and 25.2 per cent a part of the cost.

For paving alleys, 44.8 per cent assess all the cost and 26.4 per cent a part of the cost.

PERCENTAGE OF COST ASSESSED AGAINST PROPERTY FOR STREET IMPROVEMENTS.

(All cities of more than 30,000 population.)

State and City.	Opening Streets.	Grading Streets.	Paving		Curbing.	Sidewalks.
			Streets.	Alleys.		
Alabama:						
Birmingham	...	100	100	100	100	100
Mobile	...	...	100[7]	...	...	...
Montgomery	...	...	100	...	100	100
Arkansas:						
Little Rock	65	65	65	65	65	100
California:						
Berkeley	100	100	100	100	100	100
Fresno	100	100	100	100	100	100
Los Angeles	100	100	100	100	100	100
Oakland	100	100	100	100	100	100
Pasadena	100	...	85	...	...	...
Sacramento	100	100	100	100	100	100
San Diego	100	100	100	100	100	100
San Francisco	100	50 or 100[a]	50 or 100[a]	50 or 100[a]	50 or 100[a]	50 or 100[a]
San Jose	100	100	100	100	100	100
Stockton	100	100	100	100	100	100
Colorado:						
Colorado Springs	100	100	100	100	100	100
Denver	100	100	100	100	100	100
Pueblo	100	100	100	100	100	100
Connecticut:						
Bridgeport	100	100	50	50	100	100
Hartford	100	100	66⅔	66⅔	100	100
New Britain	100	100	100	100	...	...
New Haven	100	100	...[b]	...	100	100
Stamford	100	100	50	50	...	100
Waterbury	66⅔	66⅔	100	100	50	50
Delaware:						
Wilmington	...	...	...	...	65 cts.[c]	100
District of Columbia:						
Washington	100	50	50	50	50	50
Florida:						
Jacksonville	...	...	66⅔	...	...	100
Tampa	...	...	66⅔	...	66⅔	100
Georgia:						
Atlanta	...	...	66⅔	66⅔	100	100
Augusta	...	...	...	...	100	100
Macon	...	...	66⅔	66⅔	66⅔	100
Savannah	...	...	66⅔	66⅔	...	100
Idaho:						
Boise	...	100	100	100	100	100
Illinois:						
Aurora	95	85	85	85	85	100
Chicago	100	100	100	100	100	100
Danville	100	100	100	none	75	100
Decatur	100	100	100	100	100	100
East. St. Louis	100	none	100	100	100	100
Joliet	100	90	90	90	90	100
Peoria	100	100	100	100	100	100
Quincy	none	100	100	100	100	100
Rockford	100	100	100	100	100	100
Springfield	100	none	100	100	100	100
Indiana:						
Evanesville	100	100	100	100	100	100
Fort Wayne	100	100	100	100	100	100
Indianapolis	100	100	100	100	100	100
South Bend	100	100	100	100	100	100
Terre Haute	100	100	100	100	100	100
Iowa:						
Cedar Rapids	100	100	100	100	100	100
Council Bluffs	...	...	100	100	100	100
Davenport	30 to 100	80	80	80	100	100
Des Moines	100	...	100	100	100	100
Dubuque	...	...	100	100	100	100
Sioux City	...	50 to 100	100	100	100	100
Waterloo	100	100	100	100	100	100
New Jersey (Continued).						
Newark	...[m]	...[m]	...[m]	...[m]	...[m]	...[m]
Orange	100	100	100	100	100	100
Passaic	...[m]	...[m]	...[m]	...[m]	...[m]	...[m]
Paterson	...[m]	...[m]	66⅔	66⅔	...[m]	100
Perth Amboy	100	...	66⅔	66⅔	100	100
Trenton	...[m]	...[m]	...[m]	...[m]	...[m]	...[m]
West Hoboken	...[m]	...[m]	...[m]	...[m]	...[m]	...[m]
New York:						
Albany	100	100	100	100	100	100
Amsterdam	75	75	50	50	100	100
Auburn	...	...	50	50	100	100
Binghamton	100	...	50	50	50	50
Buffalo	100	100	100[o]	100[o]	100[o]	100
Elmira	...	...	20	100	100	100
Jamestown	...	...	100	100	50	100
Mount Vernon	100	100	66⅔	...	100	100
New Rochelle	...[n]	...[n]	66⅔	66⅔	$2 per ft.	$2 per ft.
New York	93	...	93	...	93	...
Niagara Falls	100	...	100	100	100	100
Poughkeepsie	90	60	60	...	100	100
Rochester	100	100	100	100	100	100
Schenectady	100	100	100	100	100	100
Syracuse	100	100	100	100	100	100
Troy	50	50	50	50	100[p]	100
Utica	100	...	66⅔	...	66⅔	100
Yonkers	...[q]	...	...	...	...	...
North Carolina:						
Charlotte	...	...	100	...	...	100
Wilmington	...	...	...	...	...	...
Winston-Salem	...	...	100	...	...	100
Ohio:						
Akron	98	98	98	98	98	...
Canton	...	98	98	98	98	...
Cincinnati	98	98	98	98	98	100
Cleveland	...	100	98[r]	98	98	...
Columbus	...	98[r]	98[r]	98	98[r]	100
Dayton	...	98	98	98	98	100
Hamilton	...	...	98	98	98	98
Lima	...	...	98	98	98	100
Lorain	...	...	85	85	85	100
Springfield	...	98[r]	98[r]	98[r]	98[r]	100[r]
Toledo	...	98	98	98	98	100
Youngstown	...	98	98	98	98	98
Zanesville	...	...	98	60	98	100
Oklahoma:						
Muskogee	100	100	100	100	100	100
Oklahoma City	100	100	100	100	100	100
Tulsa	100	100	100	100	100	100
Oregon:						
Portland	100	100	100	100	100	100
Pennsylvania:						
Allentown	100	...	100	...	...	...
Altoona	...	...	100	100	100	100
Chester	100	100	80	90	100	100
Easton	...	...	100	...	...	...
Erie	...	100	100	100	100	100
Harrisburg	100	100	100	...	100	...
Johnstown	...	...	66⅔	66⅔	100	100
Lancaster	...	...	...	...	...	...
McKeesport	...[m]	...[m]	...[m]	...[m]	...[m]	...[m]
Newcastle	66⅔	66⅔	66⅔	66⅔	66⅔	100
Norristown	...	...	...	100	100	100
Philadelphia	...	...	100	100	...	...
Pittsburgh	25[m]	40[m]	40[m]	40[m]	40[m]	...
Reading	100	100	...	100	100	...
Scranton	...	100	100	100	100	100
Wilkes-Barre	...	...	100	100	100	...
Williamsport	...	...	100	100	100	100
York	...	...	100	...	...	...

Kansas:						
Kansas City	100	100	100	100	100	100
Topeka	100	100	100	100	100	100
Wichita	100	100	100	100	100	100
Kentucky:						
Covington	...	100	100	100	100	100
Lexington	...	...	100[f]	100[f]	100	100
Louisville	...	...	100[f]	100[f]	100	100
Newport	...	...	100[g]	100[g]	100	100
Louisiana:						
New Orleans	...	...	100	...	100	100
Shreveport	...	...	100	100	100	...
Maine:						
Portland	100	...	...	...	50	50
Maryland:						
Baltimore	100	...	...[b]	...	...	...
Massachusetts:						
Boston	...	...	50	50	50	50
Brockton	...	...	...	...	50	50
Brookline	100	100	...	...	...	...
Cambridge	...	...	...	...	material	material
Chelsea	...	...	...	...	50	50
Everett	...	...	...	...	50	50[i]
Fall River	...	...	...	...	...	...
Fitchburg	50	...	...	...	material	50
Haverhill	...	...	...	...	50	50
Holyoke	...	...	...	...	50	50
Lawrence	...	...	...	...	50	50
Lowell	100	100	...	...	100	100
Lynn	...	...	...	...	...	50
Malden	33⅓	...	...	...	...	50
New Bedford	...	...	...	...	...	50
Newton	100	100	100	100	50[i]	50[i]
Pittsfield	...	...	66⅔	...	50	50
Quincy	...	...	...	...	33⅓	33⅓
Salem	...	...	...	...	...	...
Somerville	...	50[k]	...	...	50[k]	50
Springfield	50	50	50	50	material	100
Taunton	...	...	...	...	...	...
Waltham	50	50	50	50	50[i]	50[i]
Worcester	...	...	...	...	75	75
Michigan:						
Bay City	...	...	70	70	70	70
Detroit	85	...	100	100	100	100
Flint	75	75	100	100	100	100
Grand Rapids	100	100	100	100	100	100
Jackson	100	...	100	100	100	100
Kalamazoo	100	100	100	100	100	100
Lansing	...	100	66⅔	66⅔	100	100
Saginaw	100	100	100	100	100	100
Minnesota:						
Duluth	100	100	100	100	100	100
Minneapolis	100	100	100	100	100	100
St. Paul	100	100	100	100	100	100
Missouri:						
Joplin	...	100[l]	100	100	100	100
Kansas City	100[l]	100[l]	100	100	100	100
St. Joseph	90[l]	90[l]	100	100	100	100
St. Louis	95[l]	...	100	100	100	100
Springfield	100[l]	100[l]	100	100	100	100
Montana:						
Butte	100	100	100	100	100	100
Nebraska:						
Lincoln	...	...	100	100	100	...
Omaha	100	100	100	100	100	100
New Hampshire:						
Manchester	...	...	...	...	...	..
New Jersey:						
Atlantic City	...	...	66⅔	...	...	100
Bayonne	100	100	100	100	100	100
Camden	...	...[m]	...[m]	...[m]	...[m]	...[m]
East Orange	...[m]	...[m]	...[m]	...[m]	...[m]	...[m]
Elizabeth	...[m]	...[m]	...[m]	...[m]	100	...
Hoboken	...[m]	...[m]	...[m]	...[m]	...[m]	...[m]
Jersey City	...[m]	...[m]	...[m]	...[m]	...[m]	...[m]
Rhode Island:						
Newport	...	...	...	...	...	...
Pawtucket	...	...	...	...	materials	50
Providence	...	...	...	...	75c. per ft.	100
Woonsocket	...	...	...	...	materials	...
South Carolina:						
Charleston	...	...	66⅔	...	...	66⅔
Columbia	...	...	50	50	...[p]	50
Tennessee:						
Chattanooga	...	...	66⅔[a]	...	100	100
Knoxville	...	...	66⅔	66⅔	...	...
Memphis	66⅔	66⅔	66⅔	66⅔	...	...
Nashville	...	...	66⅔	...	100	100
Texas:						
Austin	...	...	80	80	100	100
Dallas	100	100	100	...	100	100
El Paso	...	...	100	...	...	...
Fort Worth	...	...	100	100	100	100
Galveston	...	...	66⅔	100	100	100
Houston	...	...	...	...	...	...
San Antonio	...	...	66⅔	...	...	...
Waco	...	66⅔	66⅔	100	100	100
Utah:						
Ogden	100	100	50	100	100	100
Salt Lake City	100	100	50	...	100	100
Virginia:						
Lynchburg	...	...	...	...	...	33⅓[t]
Norfolk	...	...	...	...	...	...
Portsmouth	...	...	...	...	...	...
Richmond	...	...	...	75	...	75
Roanoke	...	...	...	...	...	33⅓[u]
Washington:						
Bellingham	100	100	100	100	100	100
Everett	100	100	100	100	100	100
Seattle	100	100	100	100	100	100
Spokane	100	100	100	100	100	100
Tacoma	100	100	100	100	100	100
West Virginia:						
Charleston	100	100	100	100	100	100
Huntington	...	100	100	100	100	100
Wheeling	66⅔	66⅔	66⅔	66⅔	66⅔	100
Wisconsin:						
Kenosha	100	...	100	100	100	100
La Crosse	100	100	100	100	100	100
Madison	100	100	66⅔	66⅔	66⅔	100
Milwaukee	...[m]	100	100[v]	100	100	100
Oshkosh	...[m]	100	100	100	100	100
Racine	...[v]	4 cts. per foot	100	100	100	100
Superior	100	100	100	100	100	100

[a]Either 50% or 100%, usually the latter, contingent upon the value of the property and the extent of the area benefited. [b]Asphalt on concrete base, 60 cts. per front foot; wood block, 70 cts.; bituminous macadam, 35 cts.; hassam, 50 cts. [c]Per front foot for straight curb, 90 cts. for curved. [d]Certain improvements under the Board of Park Commissioners. [e]May be assessed. [f]Original paving only. [g]Original paving only; one-half cost of replacement assessed. [h]Assessments collected in ten annual installments of 15 cts. per front foot on roadways 30 ft. wide or over; 10 cts. per front foot for roadways 15 to 30 ft. wide; 5 cts. for less than 15 ft. width. On streets with railway tracks the company is assessed 50% of cost of paving. [i]Not in excess of 1% of the assessed valuation of the abutting property. [k]Of adjudged benefits, usually between 50% and 100% of the cost. [l]Against benefited property. [m]According to benefits. [n]All cost in excess of $5,000. [o]100% of original paving and 66⅔% of repaving. [p]50% if constructed in connection with paving. [q]No uniform rate; special ordinance for each improvement. [r]Regrading, repaving, etc.; 98% less ½ cost of original improvement in Columbus; ½ cost in Springfield; not more than 50% in Cleveland. [s]Cannot exceed 25% of value of assessed property exclusive of improvements thereon. [t]Generally 66⅔% by special agreement with property owner. [u]Or 50% by special agreement with property owner. [v]Not more than 5% of assessed value of property. [w]Up to $3 per square yard and ½ remainder, if any. [x]66⅔% for business streets.

Note: In all Illinois cities except Aurora and Joliet 100% of cost of "street betterments" is assessed; in Somerville, Mass., 50% of "adjudged benefits" from "street betterments," and in Worcester, Mass., 50% to 100% of cost of betterments, according to benefits.

Of the cost of street parking, San Francisco assesses 50% to 100%; Indianapolis, 100%; Minneapolis, 100%. Of the cost of parks, San Francisco assesses 50% to 100%; Washington, D. C., ⅛ to ½ of cost; Minneapolis, 100%; New York, 93%; Fort Wayne may assess 100%; Indianapolis assesses certain improvement made by Park Commissioners.

For constructing curbs, 54 per cent assess all the cost and 28.7 per cent a part only.

For constructing sidewalks, 64.4 per cent assess all the cost and 19.2 per cent assess a part only.

Where no assessment is reported it is assumed that the improvement was paid for from the common fund.

ASSESSMENTS FOR PUBLIC SERVICES.

Quite a large number of cities assess directly on benefitted properties the cost of certain public services rendered. A list of these is given below:

For sprinkling streets—The entire cost is assessed by Bridgeport, Hartford and Waterbury, Conn.; Augusta, Ga. (for unpaved streets); Boise, Ida.; Evansville, Ind.; Brockton, Chelsea, Haverhill, Lawrence, Lowell, Lynn, Malden, Pittsfield, Salem, Somerville, Springfield, Taunton and Worcester, Mass.; Duluth, Minneapolis and St. Paul, Minn.; Joplin and St. Louis, Mo.; Butte, Mont.; Auburn, Buffalo, Elmira and Syracuse, N. Y.; Columbus and Toledo, O.; Fort Worth, Tex.; Kenosha, Milwaukee, Oshkosh, Racine and Superior, Wis., Portland, Me., assesses 90 per cent.; Quincy, Mass., 50 per cent.; Fitchburg, Mass., assesses from two-thirds to three-fourths, varying with the width of the street. New Britain assesses 1½ cts. per front foot; Fall River, 2 cts.; Newton and Waltham, Mass., 3 cts.; Cambridge, Mass., 4 cts. Rochester, N. Y., that portion of the cost not paid by the street railway company.

Oiling streets—The entire cost is assessed by Pasadena and San Francisco, Cal.; Wichita, Kan.; Joplin and St. Joseph, Mo.; Buffalo, N. Y.; Cincinnati and Hamilton, O.; Williamsport, Pa.; Kenosha and Milwaukee, Wis., and Racine, Wis., part of the cost.

Removing snow from sidewalks—The entire cost is assessed by Des Moines, Cedar Rapids, Council Bluffs, Davenport, and Sioux City, Ia.; Binghamton, Buffalo, Elmira, Poughkeepsie, Rochester and Utica, N. Y.; Williamsport, Pa.; Kenosha, La Crosse, Madison, Milwaukee, Oshkosh and Racine, Wis.

Cleaning roadways—The entire cost is assessed by Akron, Dayton, Columbus, Toledo and Youngstown, O., and 50 per cent. of the cost by Rochester, N. Y.

Cleaning sidewalks—Fort Worth, Tex., assesses the cost.

Repairing sidewalks—Minneapolis, Rochester, Milwaukee and Oshkosh assess the entire cost, and Superior part of it.

Care of street parking—Pasadena, San Francisco and St. Paul assess the entire cost.

Planting shade trees—Minneapolis assesses the entire cost.

Care of shade trees—St. Paul and Newark, N. J., the entire cost.

Moth Extermination—The entire cost is assessed by Portland, Me.; Manchester, N. H., and all Massachusetts cities when done on private property.

Cutting Weeds—Entire cost by Los Angeles, Pasadena and Sacramento, Cal.; Boise, Ida.; Cedar Rapids, Council Bluffs, Davenport and Sioux City, Ia.; Topeka and Wichita, Kan.; Buffalo, N. Y.; Oklahoma City, Okla.; Kenosha, La Crosse, Madison, Milwaukee, Oshkosh and Racine, Wis.

Filling in lots—Entire cost assessed by Topeka, Kan.

Improvements and services other than those connected with street surfaces will be given in a future issue.

EFFECTS OF HEAVY TRAFFIC

Weight of Heavily Loaded Trucks Using the Main and Residence Streets in Several Hundred Cities, and Damage Resulting from Such Use—Increased Thickness of Base Adopted or Recommended.

Among the items of information furnished to Municipal Journal by several hundred city engineers for this special paving number were some concerning the maximum weight of traffic using such streets and the measures taken by the city, if any, to prevent destructive effects of traffic on the pavements.

In reporting the weight of heaviest trucks that used their main thoroughfares, the average weight reported was about nine tons; but a number of cities reported much heavier weights than these, one reporting thirty tons and three reporting twenty tons. Quite a number named army trucks as being the heaviest users of their main thoroughfares. Some of the smaller towns, on the other hand, reported no trucks heavier than two or three tons. (In the questionnaire the informant was asked to give the weight of truck and load combined.)

A great many cities stated that the heaviest trucks used the residence streets as well as the main thoroughfares, but on the other hand, a great many reported that this was not the case. The average weight of trucks reported as using residence streets was about six and a half tons. Only two cities reported trucks heavier than fifteen tons using the residence streets, but quite a considerable percentage reported more than ten tons.

Although the main thoroughfares appeared to carry heavier trucks than residence streets, only a few of the cities reported any laws or traffic regulations forbidding heavy trucks to use any specified streets, the number so reporting being only twenty-two; and one of these reported that the restriction was not on account of the pavement but on account of congestion of traffic. Of the others, six named boulevards and two named park drives as those that were restricted. Manhattan, Kan., stated that heavy traffic was excluded from asphalt streets in summer.

Moline, Ill., reports that, in an effort to regulate the use of streets by heavy trucks, regular traffic between fixed points is routed over those streets that are best able to stand the load. The same is reported from Marion, Ind., although difficulty is experienced in keeping the truck drivers to the designated routes. In the latter city much damage is done by the testing of trucks, the sand cushion on brick streets shifting and macadam and even tar macadam raveling. Aberdeen, Wash., limits the loads on plank streets to a maximum of 7,000 pounds.

In spite of the heavy traffic, the number of pavements that have been damaged thereby seems to be relatively small. Only about 18 per cent of the cities reported that the pavement base had been broken in any of their streets by heavy traffic, and only 40 per cent reported the wearing surface as having been injured; and several of these reported the damage as having been done to one street only. In many and perhaps the majority of cases the damage done to the pavement might have been anticipated because of the character of the pavement, in view of the burdens imposed by modern traffic. It was rather surprising to learn of the number of cities and towns where there are still to be found brick pavements without concrete base, and in at least one city granite blocks were laid on a sand base and had been damaged by traffic on this account. Damaged brick pavements were reported as being laid on slag, gravel, brick laid flat, and in some cases upon the natural soil. Two

EFFECTS OF HEAVY TRAFFIC.

State and City.	Approximate weight of heaviest trucks using: Main thoroughfares, tons.	Approximate weight of heaviest trucks using: Residence streets, tons.	Are there any streets which heavy trucks are forbidden to use?	Where pavements have been damaged by heavy trucks: Was the base broken?	How thick was such base?	Was the surface injured?	Of what material was it?	Because of increasing weight of trucks: Has thickness of base been increased?	How much?	If not, is such increase contemplated or recommended?
Alabama:										
Gadsden	11	11	No	No	...	No	.....	No	.....	No
Troy	20	4	No	...	...	...	.....	No	.....	Yes, from 4" to 6"
Arizona:										
Globe	..	..	...	...	...	...	.....	...	.....	.....
Arkansas:										
Fort Smith	10	¾ to 1½	No	Yes	2" sand	Yes	Bad brick	...	.....	Concrete base according to the traffic
North Little Rock	5	3 to 5	No	Yes	5"	Yes	Concrete	No	.....	Yes
California:										
Berkeley	15	15	No	Yes	5" & 6"	Yes	Asphaltic	No, but have increased cement content	.....	Prefer to use extra care on subgrade
Ontario	10	4	No	No	Concrete 4" Macadam 5"	No	.....	No	.....	Recommend increasing from 4" to 5", & mix from 1:2½:5 to 1:2:4
Palo Alto	10	10	No	No	...	No	.....	No	.....	No
Pomona	10 to 12	..	Yes[a]	No	4" largely	...	Asphalt	No	.....	No
Redwood City	15	..	Only by request	Yes	4" & 6"	Yes	Asphalt macadam	Yes	Minimum 6½"	.....
San Luis Obispo	7 or 8	..	No evidence	...	...	...	.....	No	.....	No
Santa Maria	9	3 to 9	No[b]	No	8"	Yes	Asphalt macadam	No	.....	.....
Stockton	7½	3½	No	...	...	...	.....	...	.....	Will investigate
Upland	12	12	No	No	...	No	.....	No	.....	No
Colorado:										
Longmont	8 to 9	2 to 5, sometimes 9	No[c]	...	...	...	.....	No	.....	.....
Pueblo	10 or 11	8	No—no ordinances	...[d]	...	...	.....	No	.....	No
Salida	8	8	No	...	...	...	.....	No	.....	No
Connecticut:										
Ansonia	10	5	No	...	...	...	.....	No	.....	.....
Manchester	12	8	No	...	...	...	.....	...	.....	.....
Stamford	12	12	No	No	...	No	.....	No	.....	No
Winsted	10 to 12	10 to 12	No	No[e]	...	...	.....	...	.....	.....
District of Columbia:										
Washington	15	15	Park drives	No	...	...	.....	No	.....	No
Florida:										
De Land	...	...	No	...	...	...	.....	.....	.....	.....
Fort Myers	4½ to 5	3½ to 4½	No	...	...	...	.....	No	.....	Yes
Sanford	6	..	No	...	...	Yes	Brick, sand base	.....	.....	Yes
Georgia:										
Americus	6	6	No	No	...	No	.....	Yes	50%	.....
Idaho:										
Boise	8	8	No	No	...	No	.....	No	.....	No
Pocatello	5	5	No	...	...	...	.....	No	.....	Yes, abt. 20% thicker
Illinois:										
Benton	2	2	...	No	...	No	.....	.....	.....	(f)
Canton	12	5	No	Yes	2-course bk.	Yes	Small pavers	.....	.....	Yes
Champaign	8½	1 to 8½	No	...	...	...	.....	No	.....	No
Chicago Heights	12	6 to 8	Yes	No	...	Yes	Brk. 2" sand cushion, asphalt fill	No	.....	No
Danville	8	8	No	...	...	...	.....	No	.....	From 4" & 5" to 6" & 7"
De Kalb	5	5	No	...	...	...	.....	No	.....	May in future
Dixon	7	7	No	No	...	By tractors with lugs	.....	No	.....	Contemplates 20%
East St. Louis	15	8	Yes	...	...	...	.....	No	.....	No
Freeport	..	..	No	...	...	...	.....	No	.....	Yes
Fulton	8	3 to 8	No	...	...	...	.....	Yes	From 4" to 6"	6" for heavy traffic
Harvard	3	1 to 2	Boulevard	...	...	...	.....	No	.....	.....
Highwood	12	1 to 6	No	...	...	...	.....	Yes	30 to 40%	.....
Joliet	12	12	No	No	...	No	.....	Yes	1 inch	.....
La Grange	14	14	No	...	...	Yes	Macadam	.....	.....	Yes
Marion	6	3	No	...	...	Yes	Tar macadam.	No	.....	No
Moline	10	8	(g)	Not known.	...	Yes	Asphalt, 50-70 penetration	Yes	5" to 6" use mortar cush. for brk.	.....
Naperville	8	8	No	...	...	...	.....	.....	.....	.....
Oak Park	3 to 5	3 to 5	Boulevards	Yes	6"	Yes	Asphaltic concrete	.....	No	.....
Savannah	4	..	No	...	...	Yes	Brick, sand filler	.....	.....	Yes
Winnetka	5 to 15	5 to 15	One	Yes	4" to 6"	Yes	Brick and asphalt	Yes	From 7" to 12"	Yes

EFFECTS OF HEAVY TRAFFIC—(Continued).

	Approximate weight of heaviest trucks using		Are there any streets which heavy trucks are forbidden to use?	Where pavements have been damaged by heavy trucks				Because of increasing weight of trucks		
	thoroughfares, tons.	Residence streets, tons.		Was the base broken?	How thick was such base?	Was the surface injured?	Of what material was it?	Has thickness of base been increased†	How much?	If not, is such increase contemplated or recommended?
Indiana:										
Bedford	5	2 to 5	No	...	...	...	.....	.....	.....	.....
Connersville	10	5	No	...	...	...	.....	.....	.....	.....
Covington	8 to 10	Mostly light trucks	No	...	...	...	.....	No	.....	Recommend it
Crown Point	5	3	No	Where worn too low	5" to 6"	Only natural wear	Asphaltic macad.	No	.....	Yes
East Chicago	14	10	No	Yes	5"	Yes	Brick	Yes	to 6"	.....
Frankfort	5	2	No	...	...	...	.....	No	.....	In certain cases
Gary	20	5	Boulevards	In macadam	7" to 9"	Yes	Tar macadam	No	.....	.....
Jasper	3	3	No	...	...	...	.....	.....	.....	.....
Kendallville	6	4	None except those having lugs	...	...	...	.....	Yes	6" to 8" for conc.	.....
Marion	Army test trucks	..	No	(b)	...	Yes	Tar mac. & mac.	.....	.....	.....
Noblesville	6	..	No	No	...	Yes	Tar macadam	No	.....	.....
Peru	22½	22½	No	...	...	...	.....	.....	.....	.....
Seymour	8 to 10	..	No	...	...	...	.....	No	.....	Recommend 7" to 8"
South Bend	13	13	Boulevards	...	...	...	.....	In some cases	1" to 2" where traffic is heavy	.....
Terre Haute	10	10	No	...	...	Yes	Asph. bk. & conc	No	.....	Yes
Iowa:										
Atlantic	5 to 7	5	No	...	...	...	.....	.....	.....	Yes
Cedar Rapids	7	..	No	...	...	...	.....	No	.....	.....
Centerville	5	5	No	Yes	5"	Not materially	Brick	Yes	1" to 2"	Yes
Clinton	7	7	No	...	...	...	.....	No	.....	Yes
Denison	5	5	No	...	...	...	.....	.....	.....	.....
Fairfield	7	7	No	...	...	...	.....	No	.....	No
Jefferson	4	..	No	...	...	Yes	Gravel	.....	.....	.....
Keokuk	5	3½	1 avenue	No	...	Yes	Asphalt macadam	No	.....	No
Marshalltown	8	8	No	...	...	...	.....	.....	.....	If heavy trucks increase
New Hampton	7	7	No	...	...	...	.....	.....	.....	.....
Sioux City	14	14	No	...	...	Yes	Asphalt	Yes	From 4" to 6"	.....
Winterset	5	5	No	...	...	...	.....	.....	.....	.....
Kansas:										
Abiline	12	12	No	...	...	...	.....	Yes	From 4½" to 5"	.....
Arkansas City	5	3	No	No	4"	Yes	Vitrified brick	No	.....	No
Atchison	6	6	No	...	...	Yes	Brick with no base	Yes	From 4" to 6"	.....
Chanute	6 to 8	6 to 8	No	No	...	Yes	Oiled macadam	Yes	From 4" to 6" for heavy traffic	.....
Emporia	10	10	No	Yes[1]	4"	Yes	Asphaltic concrete	No	.....	Yes & reinforce them with steel
Fort Scott	6	6	No	Yes	4"	Yes	Brick	No	.....	No
McPherson	2	2	No	No	...	No	.....	No	.....	Yes
Manhattan	8 to 10	8 to 10	In summer asphalt streets	No	...	Somewhat	Asphalt	No	.....	No
Parsons	3 to 5	3	No	Yes	4"	Yes	1:3:5 concrete	Yes	From 5" to 6" in business streets	Will continue to increase
Topeka	7½	..	No	...	...	Yes	Brick, sand filler	Yes	1" to 2"	.....
Kentucky:										
Covington	9	1	No	No	...	Yes	Asphalt & brick	No	.....	Yes
Louisiana:										
Kentwood	2	1	No	No	...	No	.....	No	.....	No
Lake Charles	6	6	No	No	...	No	.....	No	.....	No
New Orleans	10	5	...	No	...	Yes	Sheet asphalt	No	.....	On heavy traffic streets
Maine:										
Augusta	6	6	No	...	...	Yes	Waterbound & gravel	Yes	Depends on sub soil	Yes
Lewiston	3	3	No	No	...	Only wear	.....	No	.....	.....
Rockland	6	3	No	...	...	...	.....	.....	.....	.....
Waterville	12	..	No	No	...	Yes	Asphalt	No	.....	No
Winston	5	3	No	...	...	...	.....	.....	.....	.....
Maryland:										
Westminster	Regular army trucks	1 to 3	No	Yes	1 ft. central taper to 6" sides	Yes	Waterbound mac.	No	.....	Possibly

Adams	10	6	No	No	...	No	.....	No	.....	.....
Brockton	12	7	No	...	...	...	.....	No	.....	No
Holyoke	12	..	Bridges are posted	In some places	4" to 4½"	Rolled into waves	Asphaltic preparation	No	.....	Expect to this year[1]
Lynn	5 to 7	3 to 5	Not at present	...	...	...	.....	No	.....	.....
Peabody	12	..	No	...	...	...	.....	No	.....	To 7" for concrete
Somerville	5 to 10	1 to 5	Boulevards	...	...	...	.....	.....	.....	.....
Michigan:										
Ann Arbor	10	3	No	...	...	...	.....	.....	.....	.....
Battle Creek	11	11	No	...	...	...	.....	No	.....	No
Cadillac	10	10	Under considerat'n	...	...	...	.....	.....	.....	.....
Dowagiac	6	6	No	...	...	...	.....	...	.....	.....
Escanaba	..	...	No	...	...	Yes	Waterbound mac.	No	.....	No
Hastings	5	Small trucks	No	...	...	...	.....	No	.....	Yes
Highland Park	13	13	No	Yes	6"	Yes	Asphalt	No	.....	Yes 9"
Houghton	10	10	No	...	...	...	.....	No	.....	.....
Lansing	8	8	No	...	...	...	.....	No	.....	No
Manistee	10	10	No	...	...	...	.....	No	.....	No
Sault Ste. Marie	10	10	No	...	...	...	.....	No	.....	Yes
South Haven	5	5	No	...	...	...	.....	Yes	From 6" to 8"	.....
Minnesota:										
Hibbing	...	...	No	Yes	5"	No	.....	No	.....	Yes, to 6"
Montevideo	4	...	No	...	...	...	.....	...	.....	.....
Northfield	...	...	No	...	...	...	.....	No	.....	No
Pipestone	8	5	No	Yes	6"	Yes	Concrete	No	.....	Recommend that loads be restricted
St. Cloud	7	7	No	...	...	...	.....	No	.....	.....
Virginia	6	6	No	...	...	...	.....	No	.....	No
Mississippi:										
Clarksdale	12	6	No	...	...	...	.....	No	.....	.....
Tupelo	5	1¾	No	...	...	...	.....	No	.....	Yes
Vicksburg	7	3	No	...	...	...	.....	No	.....	.....
Missouri:										
Boonville	5	½	Yes	No base	...	Yes	Brick	Yes	3" to 4"	.....
Carrollton	5	5	No	...	...	...	.....	.....	.....	.....
Independence	8	4	No	No	...	Yes	Asphalt	Yes	25%	.....
Kansas City	16	16	No	Yes	6"	Yes	Brick, wood blocks, concrete	Yes	Average 2"	.....
Kirkwood	10	10	No	...	...	...	.....	.....	.....	.....
Sedalia	8	6	No	No	...	Yes	Rock and gravel	Not yet	.....	Yes
Springfield	13	8 or 9	No	...	...	...	.....	No	.....	Yes
Washington	6	2	No, but there should be	Yes	7"	Yes	Waterbound mac.	Yes	From 6" to 8"	.....
Montana:										
Billings	12	12	No	In some places	4" concrete	Shifted	Bitulithic	Yes	From 4" to 5"	.....
Nebraska:										
Alliance	1½	1	No	...	...	...	.....	.....	.....	.....
Columbus	5	5	...	No	...	No	.....	No	.....	Yes
Fremont	5	5	No	...	...	...	.....	No	.....	5" min. for residence, 6" for business
Grand Island	6	6	No	Yes	4"	Brick wearing on edge	Brick	No	.....	.....
Lexington	3	3	No	...	...	...	.....	.....	.....	No
Lincoln	13	13	No	...	...	...	.....	No	.....	Yes, according to type of pavements
New Hampshire:										
Nashua	14	14	No	...	...	Yes	All kinds except granite block	.....	.....	.....
New Jersey:										
Bayonne	14	14	No	...	...	...	.....	Yes	From 5" to 6"	.....
Bordentown	10	6	No	No	...	Yes	Amesite	No	.....	Yes
Bound Brook	30	12½	No, but there should be	In some cases	8"	Yes	Waterbound mac.	No	.....	
Camden	8	5	No	...	...	...	.....	Yes	Up to 6", 8" & 10"	Yes
East Orange	10	3	No	No	...	Yes	Bitulithic	No	.....	No
Metuchen	..	..	No	No	...	Yes	Macadam	.....	.....	Yes, to increase thickness
New Brunswick	10	5	No	No	...	No	.....	No	.....	Yes, to 6" min.
Newton	3	3	No	No	...	(1)	.....	No	.....	Yes
Phillipsburg	10	5 to 5	No	Not known	...	Yes	Brick	No	.....	No
Plainfield	12	5	No	...	...	...	.....	Yes	20%	.....
Somerville	10	2	No	...	...	Yes	Waterbound mac.	No	.....	.....
West New York	10	3	No	Yes	5"	No	.....	Yes	8"	.....
West Orange	10	5	No	...	...	...	.....	.....	.....	.....
Westfield	12	5	In parks only	...	...	...	.....	.....	.....	Yes
New Mexico	...	...	.....	...	...	...	.....	.....	.....	.....
Roswell	5	5	No	...	...	...	.....	No	.....	No
New York:										
Batavia	3 to 5	3	No	No	...	Yes	Brick & macadam	No	.....	Now investigating
Binghamton	10	...	No	Yes	6"	Yes	Brick	No	.....	Yes, to 10"
Buffalo	12	2 to 7	No	Yes	6"	Many small cracks	Generally asphalt	Yes	Up to 9"	.....

For footnotes, see page 160.

EFFECTS OF HEAVY TRAFFIC—(Continued).

State and City.	Approximate weight of heaviest trucks using: Main thoroughfares, tons.	Approximate weight of heaviest trucks using: Residence streets, tons.	Are there any streets which heavy trucks are forbidden to use?	Where pavements have been damaged by heavy trucks: Was the base broken?	How thick was such base?	Was the surface injured?	Of what material was it?	Because of increasing weight of trucks: Has thickness of base been increased?	How much?	If not, is such increase contemplated or recommended?
New York (Continued):										
Geneva	11	8 to 10	No	...	...	...	.....	No	.....	Use 6" base, 1:2½:5
Herkimer	10	3	No	...	...	...	.....	Not yet	.....	Recommend for some sts.
Hudson	8	4	No	No	...	Yes	Brick	No	.....	Yes
Jamestown	6 to 7	2 to 3	No	...	...	...	.....	No	.....	.....
Lancaster	7	4	No	...	...	...	.....	No	.....	No
Queens Borough, N. Y.	24	9	No	Yes	4" to 6"	Yes	Asphalt, concrete, macadam base	Yes	From 6" to 8" in heavy-traffic sts.	.....
Ogdensburg	5	...	No	...	...	...	.....	.....	.....	Yes
Olean	No very hvy trucks	...	.....	...	...	...	.....	No	.....	Not at present
Plattsburg	2	2	.....	...	...	...	.....	No	.....	If traffic requires
Port Jervis	7	7	No	...	...	...	.....	No	.....	Not at present
Sidney	8	4	No	...	...	...	.....	No	.....	Not yet
Southampton	8	5	No	...	...	Yes	Asphalt oil	No	.....	On new work or resurf'g
No. Tonawanda	12	6	No	...	...	Yes	Brick	No	.....	No
North Carolina:										
Monroe	5	2	No	...	...	...	.....	No	.....	.....
North Dakota:										
Fargo	5	5	No	...	...	...	.....	No	.....	Yes
Minot	...	4	No	...	...	...	.....	No	.....	Contemplated
Ohio:										
Akron	10	About 8	No	Yes	4"	Yes	Brick	Yes	To 6" on residence, 8" on main sts.	.....
Bellefontaine	10	...	No	...	...	...	.....	...	.....	.....
Conneaut	15	15	No	No	...	Yes	Brk. without base & brick with soft filler	No	.....	Yes
Coshocton	4	3	No	No	...	Slightly	Brick	No	.....	No
Delaware	5	3	No	...	...	...	.....	No	.....	No
East Cleveland	15	4	No	Yes	4"	Yes	4" brick	Yes	To 6" with sand cement cushion on res. sts.; main sts., 8"	.....
Eaton	12	8	No	No	...	Yes	Aspnaltic concrete	Yes	1½"	.....
Findlay	14	14	No	...	...	...	.....	...	No	No
Ironton	7	7	No	No	...	Yes	Asphalt block	...	No	.....
London	12	3	No	...	...	...	.....	...	No	Yes
Lorain	18	8 to 10	No	Yes	6"	Yes	Sheet asphalt	To 8" & mix from 1:3:6 to 1:2½:4	.....	Recommend
Maryville	8	4	No	Yes	8"	Yes	Brick	No	.....	Yes
Middleton	12	12	No	No	...	Yes	Gravel	No	.....	On clay soil, not gravel
Mount Vernon	3	3	No	...	...	...	.....	No	.....	No
Sandusky	12	5	No	Yes	6" concrete	Yes	Brick	No	.....	Yes
Sciotoville	12	3	No	...	...	...	.....	No	.....	No
Steubenville	12	...	No	No base	...	...	.....	Yes	2"	.....
Troy	10	...	No	...	...	...	.....	No	.....	.....
Urbana	6	1	No	...	...	...	.....	No	.....	.....
Washington	9	...	No	...	...	Yes on acc't of settlement	Brick	Yes	To 6"	Recommend not less than 6" concrete
Xenia	4	2	No	Few places	5"	Some	Brick	...	.....	Yes
Zanesville	10	...	No	...	...	Depressions	Brick	No	.....	Have recom'ended same
Oklahoma:										
Enid	10	6	No	...	...	...	.....	Yes	2"	.....
Hobart	15	..	No	...	...	...	.....	No	.....	.....
Pennsylvania:										
Altoona	12	12	No	No	Sunken in spots	Yes	Brick	No	.....	No
Berwick	12½	..	No	Yes	5"	Yes	Brick	Yes	From 5" to 6"	.....
Bloomington	10	..	No	...	...	...	.....	Not yet	.....	.....
Butler	10	5	No	No	...	Yes	Poor brick	No	.....	Yes
Carlisle	..	Heaviest army trucks	No	...	...	...	.....	...	.....	For new work recommend 5" to 6" base
Clearfield	8	8	No	...	...	...	.....	Yes	From 9" to 12"	.....
Duquesne	..	..	No	...	...	Yes	Brick on slag or gravel	No	.....	Considering it
Ellwood	6	6	No	No	...	Slightly	.....	No	.....	Yes
Freeland	4 to 5	½ to 2	No	No	...	Yes	Macadam & gravel	Not yet	.....	Yes
Greensburg	12	8 to 9	No	Compressed out of shape	6" to 8"	Yes	Brk. on slag base, sand cushion	No	.....	Contemplate using 6" concrete base
Harrisburg	Heaviest U. S. Gov. tr'ks	2 to 7	No	No	...	No	.....	No	.....	.....

Hazleton	8	½ to 5	No	...	...	...	.....	No	.....	No
Jeannette	12	8	No	...	...	...	.....	No	.....	(m)
Lansford	5	5	No	...	...	...	.....	No	.....	Not at present
Lebanon	5	5	No	...	...	...	.....	No	.....	No
Lehighton	Army trucks	5	No	...	...	...	.....	Yes	From 4" to 7"	Yes
Norristown	3½	1½	Park boulevard	In some places	4½ to 5	In some places	Brick & bitulithic	Yes	2½"	Now 6½" to 8"
North Braddock	10	8	No	...	...	...	.....	Yes	From stone & gra'l base to 6" conc.	.....
North East	20	5 to 8	No	...	...	...	.....	No	.....	Not at present
Philadelphia	10 to 20	...	No	No	...	Modulated	Sheet asphalt	No	...	No, but more attention should be given preparation of sub-base
Pittsburgh	10	1 to 5	No	...	...	...	...	No	...	From 6" to 8" & 9"
Punxsutawney	7	...	No	...	...	...	...	No	...	.....
Reading	12 & 14	1½ to 12	No	...	...	Dev'd waves	Bit. hot mix mac.	No	...	.....
Royersford	10 to 12	...	No	...	...	...	...	No	...	Yes
Schuylkill	4	4	No	...	...	...	...	No	...	Yes
Sewickley	15	10	No	Yes	6"	No	Brick	No	...	No
Shippensburg	5	...	No	No	...	Yes	Macadam	No	...	Yes
Somerset	9	9	No	...	...	...	...	No	...	No
Waynesboro	6	8	No	...	...	...	...	No	...	Yes
West Homestead	8	5	No	...	...	...	...	...	...	.....
Williamsport	9¼	...	No	...	...	Just worn	Brick	No	...	Not at present
York	10	10	No	...	...	...	...	No	...	.....
South Carolina:										
Columbia	Army trucks	5	No	...	...	Not much	...	Not yet	...	Slightly perhaps
South Dakota:										
Madison	5	5	No	...	...	...	...	No	...	Yes
Mitchell	4	4	...	...	...	...	...	No	...	Yes
Tennessee:										
Greenville	7	7	No	...	...	...	...	No	...	Yes
Lebanon	8	...	No	...	...	...	...	No	...	Yes
Union City	8	8	No	Yes	...	Yes	Gravel	No	...	Yes
Texas:										
Dallas	12	12	No	...	...	...	...	No	...	Business sts. from 6" to 8"; residence sts. 5" to 7"
Palestine	8	3½	No	No	...	No	...	...	...	.....
Plainview	6	6	No	...	...	...	...	No	...	No
San Angelo	7	7	No	Yes	5"	No	Wood block	No	...	No
Utah:							...			
Logan	8	8	No	No	...	No	8" concrete	No	...	No
Murray City	5¾	5¾	No; expect to soon	No	...	Yes		No	...	No
Ogden	8	...	No	...	...	...	...	No	...	No
Provo	...	...	No	...	...	...	...	No	...	Not at present
Richfield	16	6	No	...	...	...	...	No	...	.....
Salt Lake City	6	6	No	No	...	...	...	No	...	No
Virginia:										
Danville	6	6	No	No	...	Yes	Cobble, sand base	Yes	50%	.....
Fredericksburg	8	8	No	No con. base	...	Yes	Asp. mac. on gr'v'l	...	...	Will prob. use 6" base
Martinsville	10	6	No	Yes	5"	Yes	Concrete	Yes	2"	.....
Suffolk	8	4 to 6	Now contemplating ordinance	Yes	5"	Yes	Bitulithic & brick	Yes	From 6" to 8"	.....
Vermont:										
Rutland	8	8	No	...	...	...	...	...	...	.....
Washington:										
Aberdeen	9½	5	Plank sts. max. 3½	Yes	4"	Yes	Sheet asphalt	No	...	Yes, to 6"
Chehalis	9	7	No	...	...	...	...	No	...	Yes, on main sts.
Olympia	...	...	No	...	...	...	...	No	...	Yes
Raymond	10	5	Some trestles	Joists, deck		Yes	Plank	Yes	J's'ts. 3x4"-15" cen.	.....
Seattle	...	...	No	Yes	4", 1-4-7 mix	Yes	Sheet asphalt 2"	Yes	6" min., 8" in frequented district	Yes
Walla Walla	12	12	No	...	...	...	...	No	...	No; sub-base very firm
Wenatchee	9	9	No	...	...	...	...	...	...	No
Yakima	10	10	No	...	...	...	...	In some cases	From 4" to 5" con.	Yes
West Virginia:										
Keyser	10	..	No	Sand base	3" or 4"	Yes	Brick	No	...	.....
Wisconsin:										
Appleton	5	5	No	...	...	...	...	No	...	Yes
Ashland	5	5	No	...	...	...	...	No	...	No
Baraboo	7	4	No	...	...	...	...	No	...	.....
Beloit	10	10	No	No	...	Yes	Brick	No	...	.....
Edgerton	5	Lt. vehicles	No	No	...	No	...	No	...	.....
Fond du Lac	10	..	No	...	...	...	...	No	...	Not at present
Janesville	5	5	No	...	...	...	...	No	...	Yes
Jefferson	10	8	No	...	...	...	...	No	...	Yes

For footnotes, see page 160.

EFFECTS OF HEAVY TRAFFIC—(Continued).

State and City.	Approximate weight of heaviest trucks using		Are there any streets which heavy trucks are forbidden to use?	Where pavements have been damaged by heavy trucks				Because of increasing weight of trucks		
	Main thoroughfares, tons.	Residence streets, tons.		Was the base broken?	How thick was such base?	Was the surface injured?	Of what material was it?	Has thickness of base been increased?	How much?	If not, is such increase contemplated or recommended?
Marinette	10	10	No	...	...	...	...	No	...	Yes
Oshkosh	10	10	No	...	...	...	...	No	...	Will come later
Superior	10	6	No	A few places	5"	Yes	Asph. & gran. blk. Crushed granite & asphalt	Yes	From 5" to 6"	.....
Waukesha	15	..	No	...	...	Yes	Brick	No	...	No
Wausau	10	6	No	No	...	Yes		No	...	No, use 7" base
West Allis	12	8 to 12	No	Not much	...	Yes	Asphaltic concrete	No	...	No
Wyoming:										
Cheyenne	6	4 to 6	No	...	...	...	...	...	...	.....
Sheridan	10	10	No	...	...	...	...	No	...	No
Canada:										
Galt, Ont.	5	2	No	...	...	...	...	No	...	No
London, Ont.	18	..	No	...	...	...	...	Yes	From 5" to 6"	.....
Ottawa, Ont.	8	..	Only one street	No	...	Yes	Asphalt	Yes	2"	.....
Regina, Sask.	7	7	No	No	...	Yes, rutted	Bitulithic	No	...	Yes
St. John, N. B.	5	..	No	No	...	Yes	Tar macadam	No	...	Not as yet

[a]Not on account of pavement, but congestion of traffic. [b]But will be as soon as ordinance is drafted. [c]Tractors with lugs are forbidden use of paved streets. [d]No pavements have been damaged perceptibly, but some bridges and viaducts have. [e]No, but our macadam does not stand up under truck traffic. [f]Standard practice is 4", think it should be at least 6". [g]Regular traffic between fixed points is routed over streets best able to stand the load. [h]Shifting of sand cushion on brick streets, raveling on macadam or tar macadam. [i]Not sure it was caused by trucks. [j]Not at present, but a traffic study is being made to that end. [k]Advise 6" concrete or heavier, according to nature of sub-base. [l]Think it is worn out faster by heavy trucks than by light traffic. [m]Would recommend 6" concrete base and brick laid to form a monolithic pavement. [n]Only to extent of wearing a "rut" from continuous travel in one place. [o]4 x 12 16-ft. joists, 2 ft. on c.; 4 x 12 deck.

cities in Washington report plank pavements damaged by army trucks. Two cities in Kansas report brick pavements damaged by circus wagons, one a two-course brick and the other on a four-inch base. Sheet asphalt pavements were of course provided with a base in most instances, but the wearing surface was injured by the traffic in spite of this. A considerable number of pavements injured were bituminous macadam, with a few water-bound macadam and gravel pavements.

Replying to the question whether, because of the increasing weight of trucks, the city had increased the thickness of base of its pavements, only 49 replied that they had done so. Quite a number of these reported increase in the thickness up to six inches from a less thickness, but several have begun laying much heavier base. For instance, Winnetka, Ill., increased the base to 12 inches; Kendallville, Ind., South Haven, Mich., Washington, Mo., Queensboro, N. Y., Akron, O., East Cleveland, O., Norristown, Pa., and Suffolk, Va., have increased the thickness to 8 inches; Camden, N. J., to 10 inches; Clearfield, Pa., to 12 inches. It is presumed that these heavier bases are used where the heavier traffic is expected, and this is stated in a number of replies.

New Haven, Conn., in some cases of heavy traffic streets where the ability of the sub-surface to withstand the load is doubtful, uses reinforcement in the six-inch concrete base. One engineer is hesitating about increasing the thickness of base in paving work in the hope that the state (Pennsylvania) will place a reasonable limit upon the weight of trucks allowed to use the highways; and an engineer of a Minnesota city also recommends that loads be restricted rather than that the base be increased. A few of the cities have increased the richness of the concrete used for pavement base, in some cases instead of increasing the thickness and in other cases in addition to such increase.

Quite a number of the engineers replying expressed it as their opinion that, although their cities had not yet adopted a greater thickness of base than that in use, such increase was advisable, a number reporting that they had recommended it. In all, 95 engineers reported that an increase in thickness of base was either contemplated by their city or was recommended by them.

With 12-ton, 15-ton and 20-ton trucks and loads becoming more and more common, and even 25-ton and 30-ton loads using the highways, it is apparent that it will be only a few years before the great majority of our cities will find their main highways rapidly going to pieces. Of the several hundred cities reporting, 40 per cent have already noticed the surface of at least one street being injured by the heavy traffic, while nearly half that number have found the base of the pavement broken at one or several points. Undoubtedly there are an even greater number of places where the base has been cracked but the damage has not yet made itself evident on the surface. There appears to be no inherent limit to the weight of trucks and their loads, and no matter how strong pavements are made, it is possible to produce a truck that will impose too heavy a load upon them. It seems to us that, while engineers should increase the thickness of pavement base and the nature of wearing surface so as to provide for carrying any reasonable load, on the other hand, state or federal regulation should set a limit to the load that can legally be carried over our highways. Tax-payers should not be asked to furnish rights of way for vehicles which may in time attain the weight and proportions of freight cars, and compete with these vehicles, whose operators pay for the construction and upkeep of the right of way from their own rather than from the public treasury.

Municipal Journal

Published weekly at
243 West 39th Street, New York, N. Y.
by
Municipal Journal and Engineer, Inc.

S. W. HUME, *President*
J. T. MORRIS, *Treasurer* A. PRESCOTT FOLWELL, *Secretary*

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago

Contributed Articles and Reports

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

ASSESSING PAVING COSTS.

The past few years have, we believe, seen a considerable increase in the practice of assessing the cost of street paving against abutting property. There are still a great many cities that pay for all roadway paving out of the general treasury, but the figures given in another article in this issue indicate that nearly three-fourths of the cities of the country of more than 30,000 population assess all or a part of this cost. In addition, a little more than half of the cities assess the cost of opening and grading streets.

Where the property owner must pay all or a part of the cost, there is generally a provision that at least a majority of the owners on a given block must consent to the paving of this block, which in some cases causes a delay of the paving because of a few obstructionists. On the other hand, where the paving is paid for from the public treasury, there is generally necessitated a comprehensive paving program and the voting of bonds for the same, which frequently leads to even more delay. In some cases the city would exceed its debt limit should it attempt to pay for all paving that should be done and would thus be precluded from carrying out other necessary improvements. On the whole, the arguments and experience appear to be in favor of assessing the cost of paving, or at least a considerable part of it, the chief argument in opposition being that the paving of a main thoroughfare that is essential to the well-being of an entire community may be prevented by the unwillingness of the abutting property-owners to consent to the same.

From the point of view of equity, it appears to us, as we have several times stated in the past, that the practice which would be most fair and just to all concerned would be to assess on all residence property the cost of the type of road that would be fully adequate for the local uses of such property, any additional cost necessitated by the use of the street as a thoroughfare being provided for from the general treasury. In the case of business property, while the street is used as a thoroughfare, the fact that it is so used is of direct financial benefit to the businesses abutting thereon and it would seem perfectly proper and just that they should pay the entire cost of such pavement, unless the street is used largely by through traffic, which does not benefit the businesses along the highway, the vehicles using the same being entirely through traffic between cities or other sections outside of the city in question.

The simplest method of applying this idea would seem to be the plan adopted by several of the cities, as noted in the table, of assessing a certain cost per front foot for residence property and another cost for business property, with possibly a division of each into first and second class, depending upon the class of residences along the street or of the businesses benefited by the traffic on such street. This has been modified in a few cities by permitting the payment of the assessment in five or ten annual installments, thus making the payment easy for the property owner.

TO PAVE OR NOT TO PAVE.

Although the opinions of the eleven engineers covering all sections of the United States that are published in the leading article this week do not all agree as to the amount of paving that will be done in 1919, they at least all recognize that a very considerable amount *should* be done. Probably every city and town in the country omitted last year to do work that they would have done had conditions been different. Moreover, in a number of cities and along several of the cross-country highways the wear on pavements has been more than normal because of the unusual number and weight of army trucks and other vehicles engaged in war work. As the engineer of Troy, N. Y., says, in anticipating a paving program this year 25 per cent to 33 per cent greater than in normal years, "our expectation is based on the necessity of catching up with the program adopted prior to the war, as well as providing profitable employment for idle labor."

In state work, construction has fallen even further behind the program of two years ago than in the generality of city work. Take for instance the matter of road construction utilizing the federal aid provided by Congress. Projects were approved for the construction of about 7,870 miles of roads, for aid in building which Congress had appropriated $48,500,000, but of this total less than 45 miles have been constructed. The remaining 7,825 miles has been approved of and the government contribution is available to aid in paying for its construction. The construction of these roads would involve the expenditure of about $56,172,000. Not a single state has constructed a mileage of federal aid roads that even approximates that approved by the government for federal aid.

Figures from perhaps a quarter of the cities of the country show that there is need in that number of more than sixteen million square yards of paving this year, and it is encouraging to learn that these cities have already planned to construct about half of this amount.

There can be little doubt that practically all of this needed paving work would go ahead with the opening of the building season but for one thing—the feeling on the part of many, if not most officials, that prices will fall within the next few months, and that by holding off construction until fall or even until next year if necessary, considerable saving can be made in cost of construction. On the other hand, a number who have looked into the matter are of the opinion that no great drop in prices may be anticipated for the present. Reporting from Omaha, city engineer John A. Bruce, says "I am convinced that only slight reductions in prices can be expected in the next few years." The U. S. Department of Labor, while it does not deny that road materials and labor costs are high, states positively that "indications are that prices will remain high for some time to come, and, in view of the forecasts for market conditions, it is imprudent to longer hold up construction anticipating

lower construction costs." A great many of the projects for road construction are more or less pressing, and if they are not carried out until 1920, cities or other communities may suffer therefrom a loss both in destruction of the road and hindrance to traffic that will more than equal the amount that might be saved by delaying construction.

There is another reason for deciding at once to go ahead with at least a normal amount of work this year. C. M. Talbert, director of streets and sewers of St. Louis, refers to this when he says: "We feel that we should place on the market at the earliest possible moment a sufficient amount of work to justify contractors in organizing their forces for a full season's work and material men in opening up their plants on the same basis." A large number of contractors who make a business of constructing public works, and who ordinarily count upon sufficient work of this kind to give full employment to their plant and warrant them in engaging foremen and making arrangement for laborers at the beginning of the season, this year are uncertain as yet whether sufficient public work will be forthcoming to warrant such action. In the case of brick plants, quarries, sand and gravel pits, etc., the operators also are in the same dilemma. When the construction season begins, the products of these plants are demanded in large quantities for immediate delivery, and they must therefore begin work long before the season opens in order to have on hand a stock of material to meet such demands. If, however, there is a general feeling that there will be little work calling for materials which they produce, they will naturally hesitate about starting up plants which have been closed down, until there is some assurance of finding a market for their output. Early decision on a public works program is always desirable, but is more so this year than ever because of this uncertainty that seem to pervade every line of business. As just stated, contractors and manufacturers of building materials would ordinarily take it for granted that there would be a normal demand for their goods in the spring and would act accordingly; but this year they are uncertain whether such demand will materialize, and municipalities should do all they can to give them early notice that it will.

If manufacturers do not receive early and definite assurance that it will pay them to turn out a stock of building supplies for this year's consumption, and work starting up in the spring should find a scarcity of such supplies, the natural tendency would be for prices to increase rather than decrease. In other words, the best way to insure such lowering of prices as it is possible to obtain, is to encourage manufacturers to open up their plants at once and begin to prepare for a more than normal demand for their output.

A number of engineers, writing to us concerning the prospects of paving work for this year, have expressed the fear that an increase of a third in freight rates on sand and gravel would greatly deter many cities from carrying out public works that would otherwise be put through. This applies especially to the cities in the middle and far west, and in Indiana and Illinois state officials have taken up the matter. Under date of February 11th, we were informed by the Department of Labor that "the United States Railroad Administration asserts that there is to be no general 30 per cent advance on freight rates for sand, gravel, crushed stone and slag. The rumor that such advances were contemplated was arousing anxiety in the central west. There is no foundation for the report that the Railroad Administration has given or is giving any consideration to any increase in present basis of rates."

We have referred several times to the obligation the country is under to furnish work for the unemployed and the duty of cities to shoulder their share of this obligation. It is hardly to be expected that private industries will carry out undertakings for the sole purpose of furnishing work for the unemployed. Business is essentially and necessarily performed in order to make a profit; public works, on the other hand, are under no such compulsion, but the only penalty involved in high prices paid in connection with them is a corresponding increase in the tax rate. If, therefore, any work is to be carried on for the chief purpose of furnishing employment, it must very largely be in the nature of public work.

To sum up:

The cities and states of the country need at least $200,000,000 worth of street and road paving this year. Great numbers of laborers who are being discharged from the army or from factories engaged in war work need the wages that this expenditure would furnish, both directly, and indirectly by furnishing work for cement and brick plants, quarries, etc., thus stimulating these lines of industry. We have every confidence that a very considerable proportion, if not the whole of this work, will be done this year. If it is to be done, the sooner the decision can be reached and preparations put under way, plants started up, laborers employed and other preliminaries begun, the better it will be for all concerned.

WOOD BLOCK PAVEMENTS AT LAKEWOOD.

Method Employed in Laying Block on Pitch Cushion—Joints Filled With Pitch to One-Third Their Depth.

BY E. A. FISHER.*

There is being constructed in Lakewood, Ohio, a creosoted wood block pavement on a pitch cushion. This newer type of wood block paving was adopted to remove the difficulties experienced in buckling, bleeding, shifting of cushion and crowding curbs out of alignment.

The pavement is one mile long and part of a three-mile improvement being constructed jointly between the county of Cuyahoga and the city of Lakewood on Detroit avenue, a main thorofare from the city of Cleveland extending through the city of Lakewood into the truck farming districts to the west. It receives heavy traffic from trucking of farm products, local trucking of building materials and supplies of various kinds for commerce. It is also subject to heavy traffic for through trucking east and west of Cleveland.

The original pavement in this street was sheet asphalt, two-inch top, one-inch binder on four inches of concrete base and served the city for seventeen years. Due to underground construction of half a dozen varieties, the original pavement was badly cut up and this together with the increased heavy traffic rendered the pavement nearly impassable.

The pavement is 42 feet wide and contains a double line of street railway tracks. At those places where the track is out of repair, a concrete header 9 in. by 24 in. integral with base is constructed at the ends of the ties. The top of the header, flush with the surface of the street, is 6 in. wide and faced with a wearing surface of 2 in. of granite concrete. At points where the tracks are in good condition, the pavement is brought to the rail, but in all cases the header curb is retained below the concrete base, thus separating the street car construction from the pavement.

The pavement base is of cement concrete 8 inches thick, laid upon a sandy soil. Old trenches are bridged with steel bars to prevent future settlement of the foundation. The base mixture used is 1:2½:5, the material

* City Engineer of Lakewood, Ohio.

graded to furnish an excess of mortar. The top of the base is brought to the proper contour by use of a template and then rolled with a roller 9 inches in diameter, 6 feet long and weighing about 50 pounds. The rolling is done transversely of the street, overlapping half the width of the roller each time, and this is continued until the surplus water is rolled out of the surface and the mortar is flushed up, leaving a surface free from short waves. There is a tendency of the roller to pick up the mortar somewhat, leaving slight corrugations which are smoothed out lightly with a long-handled float.

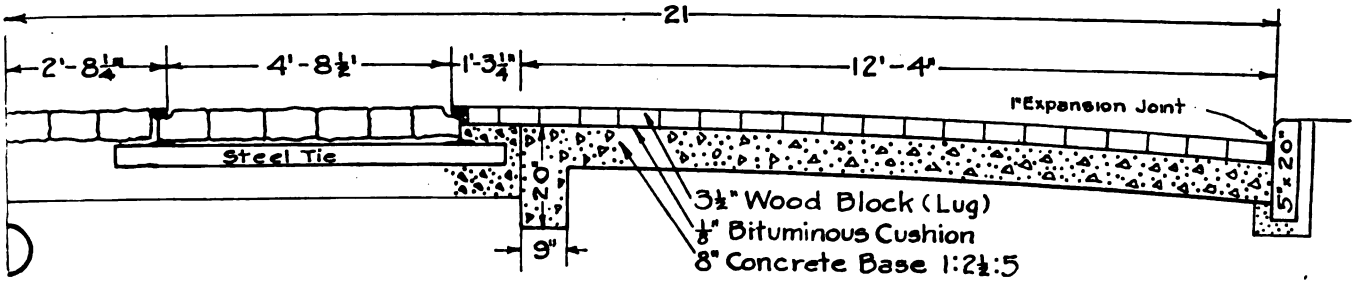
After the concrete has cured and set for the specified time and while it is dry, it is very carefully broomed to free it from dust. The work was started late last fall and the use of water for cleaning the surface was not thought feasible because the concrete would not dry rapidly enough. Any carelessness in the matter of clean sweeping that results in leaving dust on the base prevents the adherence of the pitch coat to the concrete.

Following the brooming, the pitch coat is applied by means of buckets and squeegees to the depth of one-eighth inch, care being taken not to overlap and produce uneven thickness of cushion. The melting point of the pitch is between 140 and 150 degrees F. It is applied at a temperature of 250 to 300 degrees F., depending on the dryness of the concrete and the weather conditions.

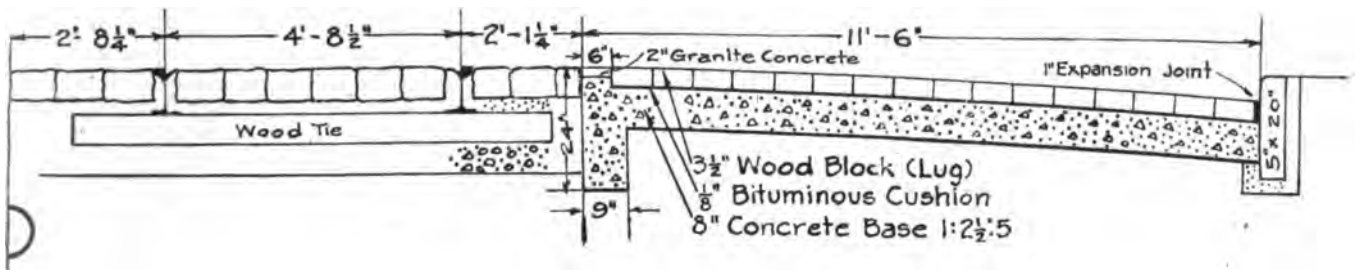
After the pitch has hardened and within 30 minutes after applying, the creosoted wood blocks are laid at right angles to the curb. They are culled and then rolled with a 5-ton tandem roller longitudinally and transversely, thus setting the block firmly into the pitch cushion and sealing the bottom of the block against moisture. A one-inch pre-molded asphalt strip is placed in the gutter to provide for expansion.

The block used is "Kreolite" lug block, 3½ inches in depth, treated with 16 pounds of creosote oil per cubic foot. The lugs on these blocks are three-sixteenths inch high, integral with the block, two on one side and one on one end. Since the lug, under expansion of the pavement, either crushes into the side of the next block or is itself crushed, it furnishes means of taking up expansion to prevent buckling and excessive bleeding. It also separates the block to provide foot-hold for toe caulks of horses, reducing the slipperiness, and to provide sufficient space to insure that the filler penetrates the full depth of the joint.

When the blocks have been set, culled and rolled, the pitch filler is applied by means of buckets and squeegees. At the first pouring the joint is filled flush full and squeegeed and after settlement there remains in the bottom of the joints very uniformly one inch of pitch. The remaining space is filled with sharp sand and a surplus of one inch spread over the paving to be ground into the joints and the surface of the blocks by traffic. The surplus will subsequently be removed. Care must be taken that the sand does not contain coarse particles which will enter the joint and bridge from block to block, thus destroying the function of the lug.



NEW TRACK CONSTRUCTION



OLD TRACK CONSTRUCTION

PAVEMENTS ALONG TRACKS IN LAKEWOOD, OHIO.

The melting point of the pitch for joints is 140 to 150 degrees F. and it is poured at a temperature of 250 to 350 degrees F. The writer believes that the higher temperature is preferable, say from 325 to 350 degrees F. or higher if the nature of the pitch will allow, since that temperature is necessary to permit removing the surplus pitch from the top of the block, leaving the top clean and avoiding waste. Any surplus left is sure to result in a gummy, disagreeable surface. A properly pitched lug-block street should never give subsequent trouble in the matter of bleeding and much of the so-called bleeding in pitch-filled streets is the result of carelessness in the matter of temperatures of the joint filler, surplus pitch on the surface, and of filling the joint too full. One third of the depth of the block is sufficient pitch in the joint to waterproof the sides of the block, which, with the seal coat, prevents the ingress of moisture at a point where the most damage is done.

It is quite likely that this newer type of creosoted wood block pavement, properly constructed, will eliminate the troubles heretofore experienced with this kind of paving material. In places where the writer has seen it under construction and later in actual service, there is plenty of evidence that it is superior to pavements laid under the older methods.

The work in Lakewood under the present contract is being done by Baldwin Bros., contractors, under the supervision of W. A. Stinchcomb, county engineer.

The WEEK'S NEWS

Pennsylvania to Go Ahead on Highways—Federal Aid Results—Portland, Ore., City Paving Plant Saves Money—Experimental Highway for Oregon—Indiana to Test Gas Heating Value—Fires in New York and Savannah—Boston Judge Blames "Public" for Molasses Tank Disaster—Mayor of Seattle Breaks "Revolution"—Minneapolis Considers Service-at-Cost Plan for Railways.

ROADS AND PAVEMENTS

Pennsylvania to Begin Work.

Harrisburg, Pa.—Governor Sproul is getting ready to make "the dirt fly" on the $50,000,000 road plan which was approved by the voters at the last election. Attorney General Schaffer has completed legislation necessary to carry into effect provisions of the constitutional amendment, authorizing a bond issue of $50,000,000 for road construction and improvement. The governor says that in his opinion the present legislature should prepare to authorize an issue of from $15,000,000 to $25,000,000 of bonds for an immediate start on his road program. The next legislature could take up the work from that point. "Now is the time to make the dirt fly," says the governor, "and it is going to fly. Some people believe this is not the proper time to start the road program, because wages are high and labor scarce. I do not agree with this view. By going into the market the state can aid in settling economic problems and can stabilize conditions. The expenditure of a few millions of dollars stimulates industry. Whatever we do with the $50,000,000 we will do it well. The road program is a great undertaking, and must be handled in a broad way. There are many men who can be employed on road work, not alone laborers, but skilled men who have been in service abroad in the engineering and other units, and who undoubtedly would be glad to find service with the state." The state will shortly take to the abandoned roadbed built by the Delaware, Lackawanna & Western Railroad from Scranton to Binghamton, N. Y., and as soon as this is done a start will be made upon improving the road, which is known as the Lackawanna trail. "This will make a splendid start on the road program," said the governor. "The company offered the road bed to the state two years ago, but it was not accepted. Now we are prepared to take title. We also intend to get busy as soon as the weather settles on improving the 40-mile stretch of road across Erie County in the 'stovepipe' region." The governor said he was continually hearing ill reports about this section.

Work of Federal Aid.

Washington, D. C.—From the passage of the federal aid road act, July 11, 1916, to December 15, 755 projects were approved by the Secretary of Agriculture, according to figures announced by the National Automobile Chamber of Commerce. These projects involve the improvement of 7,867 miles of public roads, at a total estimated cost of $57,632,000, of which the federal government has been requested to contribute $21,602,000. There have been actually completed to date twelve projects, involving a total of fifty-one miles of road, costing approximately $617,548, and on which federal aid in the amount of $260,660.19 was paid. Altogether there are more than 7,500 miles of road for which most of the steps preliminary to construction have been taken, so far as the bureau of public roads is concerned. Numerous other projects not yet reported to the department have been completed or are under construction, so that the sum total of the road work now in progress under federal aid is greater than appears in this summary. In the New England states, Connecticut, Massachusetts, Rhode Island, Vermont and New Hampshire have been interested in closing up short gaps on their main highways which are otherwise improved for the entire distances. The same condition has been true in New York, where the numerous projects are all short and undertaken with a view to linking up an extensive network of roads which are already hard-surfaced. In Pennsylvania the only long project was on the William Penn highway, where construction is under way for a distance of thirty-three miles through Dauphin, Lebanon and Berks counties, at a cost of $938,000. In Maine federal aid has been concentrated on the main post road through Portland, south through Augusta and through New Hampshire into Massachusetts. One of the features of the year's work will be the improvement of the Dixie highway, which will be done by the states acting in co-operation with the government. Thus, in Illinois, the highway will be improved from the county line north through Will, Kankakee and Iroquois counties to the Vermillion County line running south. This work will extend over a distance of 54.5 miles, at a cost of $904,700, and the construction will be of concrete and bituminous macadam. In a like manner a great deal of work will be done on what the West calls the Interstate Military highway, the line of which runs from Canada on the north to the Gulf of Mexico on the south. Seventy miles of improved road will be constructed on this highway in Colorado. The Colorado project will be joined by two projects in New Mexico, which run from Raton Pass south for a distance of 84.5 miles. The three projects taken in conjunction will mean an improvement of a continuous stretch of the highway of 161.5 miles, at a cost of more than half a million dollars. In the South, Florida is interested principally in the construction of bridges on the road from Pensacola to Jacksonville via Tallahassee, which is the old Spanish trail.

Municipal Paving Plant Saves Money.

Portland, Ore.—Through the operation of the municipal paving plant during the past seven months there has been saved to the taxpayers of Portland $27,501, the difference between what the work performed by the plant actually cost and what it would have cost had the work been performed by private contract under prevailing contract prices, according to commissioner A. L. Barbur, of the department of public works, in a detailed report of the operation of the plant since it was installed. In his report commissioner Barbur attempts to prove that new construction and repairs to pavements can be made by the municipally owned plant for nearly one-half what the same work would cost under private contract. In the construction of new pavements he says that the plant has saved the taxpayers $22,781; maintenance work $3,376 and repair of utility cuts $1,343. As the establishment of the plant cost only $8,000 and has been in operation only seven months the showing made is cited as sufficient justification for the installation of the plant. In discussing the work performed commissioner Barbur in his report said: "The production of paving material at low cost was aided by two other factors—the first that an annual contract was made for sand and gravel at pre-war rates before the market was raised by war exigencies, and the second by the substitution of crushed gravel for crushed rock in the paving mixture. The last mentioned change, which has been tried with success in other cities, reduced the cost of the paving aggregate

to a considerable amount, as the cost of the gravel has been less than one-half of that of crushed rock. On the other hand, the war has been responsible for several factors which have tended to increase the cost of pavement production. Wages of the plant and street crews have been at least 33 per cent. higher, while the cost of asphaltic cement has been at least 100 per cent. higher than before the plant began operation. In the main, however, the factors which have tended to increase the cost of paving production have heavily overbalanced those tending toward reduction. Nevertheless, the results obtained with the plant have absolutely demonstrated that the prices charged for paving under the contract system now in vogue for street improvement is and has been far in excess of the actual cost for such work.

For instance, during the summer 1.51 miles of Terwilliger boulevard, our West side park drive, was surfaced with a two-inch wearing surface of asphaltic concrete by means of the municipal plant. The contractor's estimate for laying the two-inch top of asphaltic concrete was $1.43 per square yard, exclusive of the cost of grading and scarifying the macadam foundation to a proper subgrade. The Terwilliger boulevard work was completed at a total unit cost of $0.693 per square yard, which included not only the laying of the two-inch asphaltic concrete top, but also all the scarifying and grading work, as well as the crushed rock used in rounding out the foundation. On this one piece of work alone, containing 22,464 square yards of pavement, there was a saving to the city as against the contractors' prices of $18,150.91, or nearly enough to pay the entire cost of two municipal paving plants like our own.

The city has realized a considerable saving in the matter of maintenance work during the past seven months, as 2,355.6 square yards of pavement were patched or replaced at an average cost of $1.44 per square yard instead of the average charge of $2.87 formerly paid for similar work under the contractors' schedule.

In the matter of the repair of cuts made by utility companies, it was determined during the past year to maintain the charges made by the city for such repairs at the same rate formerly maintained under the contractors' schedule, as it would be certain that such charges would be sufficiently high to protect the city against loss.

The paving plant has repaired 2,325.6 square yards of utility cuts during the past seven months at a charge under the contractors' schedule of $7,113.27, while the actual cost of the work was $5,769.29, or $1,343.98 less than the charge made, proving conclusively that the contractors' schedule is amply high and safe.

In addition to paving the Terwilliger boulevard, the paving repair plant has improved Nicolai street at a saving to the taxpayers of $914, Clifton street at a saving of $321, Mulberry street at a saving of $330, paving on bridges has been laid at a saving of $62.27, and crosswalks have been laid at a saving of $3,001.

Legislature Approves Experimental Highway.

Salem, Ore.—The house has passed Bean's experimental paving bill by unanimous vote. The measure directs the state highway commission to lay fifteen miles of continuous paving on the Pacific highway, five miles of which is to be of bituminous material, five miles of concrete and five miles of wood block. The purpose is to test the respective values of the different types of pavement.

WATER SUPPLY

New Water Works Addition Approaching Completion.

Wilmington, N. C.—The addition to the city waterworks plant, authorized several months ago, will be completed by the beginning of April, and when complete will give the city a daily water supply of more than 6,000,000 gallons of pure water. Work is being pushed rapidly on the construction of the additions to the plant. The work is being done under the direct supervision of J. L. McGehee, who comes to Wilmington from Quantico, Va., where he was engaged in Government construction work. The plans for the additional equipment were drawn by J. Newton Johnson, city engineer, who is watching the development closely. Capt. John H. Sweeney, in charge of the works, who has been out there since the first gallon of water was pumped in 1881, is also following the work. The capacity of the present plant will be increased 50 per cent by the addition of new pumping machinery, new filters and new settling basins. Excavation for the new basin is about complete, and the building of the reinforced concrete walls of the basin will begin within the next week. All the material required is in hand. The basin will be 150 feet long and 60 feet wide, having a capacity of 1,000,000 gallons. It is being built just beyond the present reservoir. When the additions are complete, the present intakes through which is pumped the raw water from the Northeast river will be abandoned, and water will be taken from the Cape Fear river two miles away. To do this will require 11,000 feet of 24-inch pipe, laid under the bed of the Northeast branch below the probable depth of any dredging operations that may be undertaken later. The main will be laid about 30 feet below the high tide level. The reason for changing from the present source of water is the fact that the water in the main river is cleaner and fresher. It comes from a source some 200 miles up the state and is not polluted by sewage. The Northeast branch is mostly "black water" from the harbor here and is heavily contaminated. It is estimated that by using the cleaner water from the Northwest branch a saving of $20 per day can be made on chemicals, or more than enough to pay the interest on the bonds required to finance the extension and development of the plant. The Northeast branch is only a few miles in length and is fed by creeks that run from swamps and the water is charged with vegetable matter and coloring. The new source of intake is above the reach of the ordinary flow of water from the harbor on the flood tide and the only matter in the water is silt and a small application of alum will be sufficient to cleanse it from all impurities. Th eimprovements at the waterworks will cost the city about $55,000 when complete.

Water Bill Increase to Be Refunded.

Charleston, W. Va.—Charleston and suburban householders who have paid the twenty per cent increase on their December water bills on account of the allowance of such an increase granted the West Virginia Water & Electric Co., in November, by the state public service commission, will get it refunded when they come to pay their January bills, or the bills for the first quarter of the year 1919. Those who refused to pay the increase will not now have to pay it for that one month. An order to this effect has been entered by the commission. In entering the order it was explained by the commission that it was not the purpose of the commission to have the 20 per cent increase become effective until January, but that the water company under the mistaken impression that the allowance was operative in December, charged up the increase for that month to those paying by the month, or that portion of it on the quarterly bills of those paying by the quarter. The order provides that the refunder ordered shall be credited on the January bills as a deduction. In entering the order, the commission takes occasion to call attention to the practice of the West Virginia Water & Electric Co. of "by-passing" water to consumers during the progress of repairs and improvements at the water plant and on occasions when large quantities of water were required by local industries and the United States ordnance plants, and directs that such practice be discontinued, even if the supply has to be cut short at those plants in order to supply domestic consumers with water not "by-passed." In the event that it becomes absolutely necessary to "by-pass" water, the commission requires that it be officially notified by the management of the water works.

STREET LIGHTING AND POWER

State Survey of Heat Value of Gas.

Indianapolis, Ind.—The gas heat standard committee formed at the suggestion of the Indiana public service commission, last October, to make a survey of artificial gas plants in Indiana and then to recommend to the commission a standard heat value for gas sold under commission regulation in Indiana, has begun on the first of a series of working tests in four typical gas plants in the state. Progress is being observed with a great deal of interest by middle west gas manufacturers, state commissions, city officials and also by the United States Bureau of Standards.

The federal bureau is co-operating also. The plant of the United Gas and Electric Company at New Albany was the scene of the first test. Tests at the plant of the Northern Indiana Gas and Electric Company at Crawfordsville, the plant of the Huntington Light and Fuel Company at Huntington and at the plant of the N. I. G. & E. at Ft. Wayne will follow. The results of the tests, with data already in the hands of the committee, will then be used to formulate a report to the commission on the proper number of British thermal units to be produced by artificial gas. The commission is not obliged to adopt the standard advised by the committee, but when it makes its own decision from the data submitted, it will adopt a standard which is to serve as the basis of regulation of rates and service. Cities will be free to require whatever number of heat units they may desire, but the commission will have a standard to go by as to rates and service. The present standard is 600 B. t. u. per cubic foot. When wartime operating conditions made it difficult for gas companies to produce 600 B. t. u. gas in Indiana they began clamoring for a reduction of the required number of heat units, with the result that the commission called a conference on the subject. Out of the conference evolved the committee. It is composed of H. C. Peffer, professor of chemical engineering, Purdue university, for the Indiana Municipal League; J. B. Klumpp, gas engineer for the United Gas Improvement Company, for the Indiana Gas Association; A. I. Phillips, associate gas engineer for the United States bureau of standards, and H. O. Garman, chief engineer for the Indiana public service commisssion. Each member of the committee, with the exception of Mr. Klumpp, is on the testing committee with A. B. Abbott and A. B. Frankle, staff assistants of the federal bureau; Frank Hiss, plant engineer at the Lafayette gas works; D. W. Hufford, J. T. Hallett and F. W. Bostel, of the commission's engineering staff; Charles O. Bond, chief of the Philadelphia laboratories of the U. G. I. Co. When the commission adopts a standard it is expected that it will base gas prices on the standard and then require gas companies to bill consumers in accordance with the actual degree of compliance with the standard so that if, for instance, gas is to be sold at 60 cents a 1,000 cubic feet for 580 B. t. u. quality and the quality of the gas falls to but 550 B. t. u. the bill will be reduced proportionately.

Would Mortgage One Utility to Purchase Another.

Madison, Wis.—Senator Zumach has introduced a bill which would authorize cities of certain classes to mortgage municipally owned plants and to purchase, establish or complete additional ones, with the proceeds of such mortgage. This bill marks a renewal of the attempt to make it easier for cities such as Madison to acquire, own and operate public utilities. The bill is really what Milwaukee socialists have long been advocating, namely, the mortgaging of the city water works to obtain money necessary to buy the street railway system now operated and owned by the Milwaukee Electric Railway and Light company. While it is not possible for Milwaukee to be named specifically, the bill obviously is aimed at that city. Previous attempts have been made to pass such a bill in the legislature. It is believed there is a good chance now of the bill becoming a law. Cities like Madison, it is said, would welcome such a law. The city owns the water works and advocates of municipal ownership of public utilities here have long stressed the possibility of mortgaging the city water plant to gain control of the Madison street railway company lines. The bill provides that any city of the first, second or third class, however incorporated, which owns or may hereafter own water works, electric lighting plant, gas plant or other public service institution, shall have the right to mortgage the water works or other public service institution to raise money to buy, establish or complete any other public service institution, on compliance with that part of the proposed law which says a majority vote of the city council shall constitute sufficient authority to put the matter up to the citizens at a special election. In case the city is not able by mortgaging the plant already owned to raise enough cash funds, the bill allows the city to use cash funds on hand to complete the purchase and then immediately to mortgage the newly acquired property to replace funds used. In Milwaukee there has been consistent opposition to this so-called socialist plan. Now, under present conditions, and with the street railway company trouble, it is felt that the bill will meet with little opposition there. Emergency measures, such as the construction of large public works and the subsequent opportunity for employment of more people, will be more feasible under this proposed law, it is said. Assemblyman John S. Kaney, of Milwaukee, has introduced a resolution, also pertaining to municipal ownership, which proposes a change in the constitution to permit cities to purchase public utilities without charging the cost to their limited indebtedness.

Survey of State-Owned Power Equipment.

Richmond, Va.—Governor Davis, in line with his economy and efficiency program, has announced the appointment of a Governor's Board of Mechanical Survey for the purpose of making careful study of the power plants, heating systems, and other mechanical equipment at the several state institutions, including the heating and lighting systems, the elevators and water system at the capitol. The following engineers were named members of the new board: Edward J. Willis, consulting engineer and inventor, Richmond; Charles Hancock, professor of mechanical engineering, University of Virginia, Charlottesville; J. C. Dickerman, engineer, State Corporation Commission, Richmond; Col. Thomas A. Jones, professor of civil engineering, Virginia Military Institute, Lexington; Col. J. S. A. Johnson, professor of applied mechanical and experimental engineering, Virginia Polytechnic Institute, Blacksburg. In announcing the appointment of this board, Governor Davis stated that as a result of his personal inspection of state institutions since his inauguration he is convinced that a good many thousands of dollars are wasted annually because of deficient and inadequate mechanical equipment and poor installation on the one hand, and through inefficient and faulty methods of operating the plants on the other. Large annual waste of coal results, for instance, he said, from present methods of firing in the power plants at a number of the state institutions. At some institutions, he thought, the furnaces and the boilers are antiquated and are costing the state more to operate them annually than it would cost to replace them with improved efficient and up-to-date equipment which would materially lower the cost of operation and furnish the required power, heat and light which many of the existing plants are unable to do. It is understood that the actual field work will be gotten under way by the early spring, and will be chiefly done during the summer months, so that its recommendations can be in the hands of the governor in time to place before the general assembly, next January.

FIRE AND POLICE

Fireman Killed in Blaze on Transport.

New York, N. Y.—One fireman was killed and several others had narrow escapes while fighting a fire in the hold of the steamship K. I. Luckenback, in the Naval Transport Service, docked at Pier 1, Bush Terminal, Brooklyn. Besides the firemen who suffered, several sailors and a military policeman dropped while battling through dense smoke in a desperate attempt to confine the blaze to the hold where it started and to recover the body of Alfred Kundie of Truck No. 114, who lost his life when, overcome by fumes, he fell down a hatchway into the hold. The damage to the ship was estimated at $100,000 and the fire was reported under control at midnight, after it had burned the hold where it started, which was filled with hay, candy and oats. When the fire was discovered the Bush Terminal fire department responded to a private alarm and

started pouring water down the hatch. Meantime a city alarm was turned in, and battalion chief Langan responded with the first quota of apparatus. By then the blaze threatened to spread to the adjacent compartment, where thousands of gallons of gasoline and crude oil were stored. Members of the Naval Reserve aided the Bush Terminal men in trying to smother the blaze. Langan sent in a second alarm, and a call for the fireboat William J. Gaynor. Meantime, Kundie, with others, had mounted a ladder on the third deck and was directing a stream into the hatchway. A sudden belch of smoke rendered him unconscious and he toppled straight into the hold, striking his head on a beam as he fell. Langan and several of his men raced below and fought desperately to rescue him. Langan himseld dropped unconscious to the deck and several of his aids fell about him. With the help of the fireboat, the flames were driven back from the entrance to the hold, and firemen were able to recover the body of Kundie. After several hours the fire was practically extinguished without having reached the gasoline and oil.

"Public" Blamed for Molasses Tank Explosion.

Boston, Mass.—"The chief blame rests upon the public itself. This simple accident has cost more in material damage alone than all the supposed economies in the building department. Laws are cheap of passage, costly of enforcement. They do not execute themselves." This statement is part of the finding of chief justice Bolster of the municipal court in the recent inquest on one of the nineteen victims of the recent disastrous explosion of a big molasses tank. The judge ordered processes against the United States Industrial Alcohol Company, owners of the tank, for violation of the law. The builders of the tank would be proceeded against in the same way if they could be reached, said the judge. The judge's statement continues: "A public which, with one eye on its tax rate, provides itself with an administrative equipment fifty per cent qualified, has no right to complain that it does not get a hundred per cent product, and so long as it accepts political influence as the equivalent of scientific attainment in a high degree, so long it must expect breakdowns in its machinery. It is no part of the business of this court to find a scapegoat to order for an indifferent or niggardly public, on the demand of the inevitable prophet after the event. The only assignable crime involved is manslaughter, through negligence. But error of judgment is not negligence, and if the public is content to buy a mere draftsman for a position demanding a high degree of technical training and skill, it can hardly complain that he is negligent in not exercising a skill which he confessedly does not have, and in view of his compensation cannot be expected to have. The men who failed are entitled to be judged acording to their lights. However, as the jurisdiction of this crime lies with the Superior Court, and as a grand jury may view the matter differently, I submit this report for their consideration. In view of the fact that other containers similar to this now exist, which may have been erected with no greater scrutiny, their efficiency should be immediately and adequately examined before this accident is duplicated. There should be an inquiry into the advisability of permitting lap-joints in structures and equipment subjected to high tension. The requirement of the Building Department, if not the law itself, should be made such that it will not be possible for a license to issue without such full information as to structural details as will expose rather than conceal points of special risk." As showing the inefficiency of the building department, the judge recites the preliminaries to construction of the tank:

"The total capacity of the tank was 2,379,000 gallons. In 1914 the Purity Distilling Company, through Arthur P. Jell, its treasurer, solicited a non-competitive bid for the steel work from the Hammond Iron Works, which had built for the distilling company smaller tanks in Cambridge, and in connection with which Jell had told the iron company that the weight of molasses was 11¾ pounds per gallon, and that his company counted on a factor of safety of three.

"Jell testified that this latter was not because of any expert knowledge or advice, but because he had had knowledge of bids for like work figured on a factor of safety of two, and desired to have it safe. Details of construction were left to the iron company.

"On Sept. 30, 1915, C. H. Gannett, an architect, filed on behalf of the distilling company in the office of the building department of Boston an application for a license to build the tank and foundation. Gannett testified in effect that he accepted the plans for steel construction at their face value and did not look into their sufficiency. It did not appear that he was hired to do other than plan the foundation. It will be noted that the application is not sworn to, as the statute permits, and that the name of the proposed mechanic is left blank.

"The distilling company informed the Hammond Company that it had learned it could work under the general license which, in fact, was issued to George H. Guyette, a carpenter in the employ of the Hugh Nawn Company, who, on his own testimony, was not competent to supervise the steel construction, and did not, in fact, supervise it in the slightest degree. In so far as the building laws contemplate the issue of a license to a person competent to do work, who shall actually do or superintend it, that purpose failed here. If such practice still obtains it should be stopped as applied to such cases as this.

"The application was accompanied by blue print plans without further specifications than are shown on the plans and which, so far as concerns critical points in the steel structure, are wholly inadequate in point of any information sufficient to show the structural factor of safety. The then commissioner, Patrick O'Hearn, testified that they were never brought to his attention.

"Apparently they followed the office routine, which was that after being looked over 'in a general way' by the desk clerk they were put in a drawer to be taken for examination in their turn by one of the three plan examiners.

"Finneran, to whom they fell, testified that so far as concerns the steel structure he passed them as adequate, assuming them to be so because the application and plans bore the name of a civil engineer. Evidently the problem, an unusual one, was beyond him.

"Carl Stuetzel, Jr., chief of the plan division, testified in effect that he must have entered his approval on the strength of Finneran's stamp and the fact that the papers came from a civil engineer. Carroll, the inspector of construction, competent as to concrete foundation, took the steel plans as adequate because a license had issued and made no supervision of the actual steel construction, being, as he admitted, not qualified to do so.

"In short, these steel plans passed through a department created for the primary purpose of safeguarding life without any checking up of the all-essential matter of structural sufficiency. So far as that department is concerned the plans licensed themselves. The only excuses offered were extreme rush of business in an under-manned department, which is probably true, and that such a tank was not a building or structure within the meaning of this law. The latter plea will hardly serve, considering that the department in fact took jurisdiction. But I am clear that the tank was a structure within both the letter and spirit of the law. In justice to the present department, it should be kept in mind that this occurred in 1915. Whether the present department is more or less efficient is not involved in this inquiry. The tank was built, formally accepted by the distilling company on Feb. 1, 1916, and put in service." Through the co-operation of the police much of the shell surrounding critical points has been reassembled and been tested by the Charlestown Navy Yard metallurgical department. The judge finds that:

"Molasses will generate by fermentation a very considerable amount of carbon dioxide gas, over 200 times its own volume. While this would ordinarily escape through the goose neck in the top, it is likely the large mass of colder, viscous molasses, which was in the tank before the January fill, may have acted as a tamping agent to confine some of the gases generated in the warmer layer pumped in from the bottom, causing enough additional pressure to furnish the proverbial 'last straw,' which seems to me the most plausible explanation of the fact that the tank stood up for forty-eight hours after the completion of its last filling. For this molasses was evidently in process of fermentation.

"Even, however, assuming the liquid charged with this gas to the point of saturation, on the lower strata, the comparative ease of its escape to the top seems to negative the idea that such conditions could have burst the tank, given a proper container.

"My conclusion from all this evidence is that this tank was wholly insufficient in point of structural strength to handle its load, insufficient to meet either legal or engineering requirements.

"I am satisfied that the adequate and predominating cause of this accident was a bursting from internal pressure exceeding its structural strength, and I so find."

Savannah Terminals Swept By Fire.

Savannah, Ga.—Fed by large quantities of resin and turpentine, fire destroyed the plant of the Southern Fertilizer and Chemical Company here and burned a swath three city blocks long and about 200 feet wide through the terminals of the Seaboard Air Line Railroad on Hutchinson Island with a loss estimated at millions of dollars. Cotton, naval stores, sugar, lumber, and nitrate of soda added to the intensity of the flames, which were controlled after five

hours of fighting by the combined forces of the railroad company and the city, aided by fire tugs. The efforts of the firemen were hindered by a thick, suffocating smoke arising from the burning resin and turpentine, and by a wind which was almost a gale. Explosions which for nearly half an hour were heard in rapid succession through the city were said to come from the flames breaking into the nitrate of soda. The fire, the origin of which has not been determined, was discovered in the railroad terminal at 3 o'clock in the afternoon and quickly spread to the fertilizer plant. It was brought under control at 8 o'clock. With the fertilizer plant more than thirty loaded freight cars were destroyed. The nitrate of soda burned was valued at $1,500,000. The terminal is across the Savannah River from the business section of the city.

GOVERNMENT AND FINANCE

City to Appeal in Case of Records.

San Francisco, Cal.—Robert M. Searls, special counsel for the city, has announced that an appeal will be taken from the decision of superior judge George E. Crothers declaring that the bureau had a right to see the Hetch-Hetchy data. In the absence of city engineer O'Shaughnessy, who is in the East, the bureau had not moved to take advantage of the Crothers decision. It had, however, according to manager Paul Eliel, determined to bring to San Francisco a hydraulic engineer of such standing that what he said about the Hetch-Hetchy dam site after he had gone over the records of diamond drill borings that O'Shaughnessy refused to throw open to the public would carry great weight in the community. But Searls' announcement now makes it appear that the municipal administration is still determined not to let the public know about the situation. However, the board of works is expected to advertise for bids for the construction of the Hetch-Hetchy dam in about a month. The disputed records will have to be made, it is said, a part of the specifications.

Woman Wants to Be Chicago Mayor.

Chicago, Ill.—Mrs. Leonora Z. Meder, a lawyer, clubwoman, and former city commission of public welfare, announced her candidacy for mayor. In making the declaration of her intentions, Mrs. Meder said: "There is no reason why a woman cannot govern the second largest city in the United States. Can you name one of the candidates who has thrown his hat into the ring who is better qualified than I?"

Seattle Mayor Suppresses a "Revolution."

Seattle, Wash.—A complete shutdown of the normal activities of the city, including most of the industries, newspapers, street cars, restaurants, schools, etc., which took on the aspects of a rebellion against constituted authority, has been practically ended. The general strike failed because of the withdrawal of the more conservative unions. The men on the municipal street car lines went out and the mayor inaugurated a municipal jitney service. Some of the engineers of the municipal light plant, who struck, were replaced by non-union men by superintendent Ross. The strikers opened union "soup kitchens" for feeding their members and dependents. Mayor Ole Hanson issued an ultimatum to the strikers, in which he threatened to "take steps to operate all essential industries and place this city under control of the Federal Government." In a proclamation to the people, he said: "By virtue of the authority vested in me as mayor, I hereby guarantee to all people of Seattle absolute and complete protection. They should go about their daily work and business in perfect security. We have 1,500 police officers, 1,500 regulars from Camp Lewis, and can and will get the services, if necessary, of every soldier in the Pacific Northwest, to protect life, business, and property. The time has come for every person in Seattle to show his Americanism. Go about your daily duties without fear. We will see to it that you have food, transportation, water, light, and gas, and all the necessities. The anarchists in this community shall not rule its affairs. All persons violating the laws will be dealt with summarily." He said: "Any man who attempts to take over government functions here will be shot on sight," and "the seat of the city government is still at city hall." With the end of the strike in sight, he issued the following statement: "The general strike has failed. This means a split between decent labor and the Industrial Workers of the World. Seattle, a loyal city, has responded nobly in this emergency. The revolution has failed. The attempt to establish a Soviet Government and control and operate all enterprises and industries has collapsed. The Government should arrest, try, and punish all leaders in this conspiracy. No skim milk policy should be adopted. The city authorities have quelled this rebellion. It is now the Government's duty to punish. The whitewash brush must not be used."

TRAFFIC AND TRANSPORATION

Subway Engineers Reinstated.

New York, N. Y.—The board of estimate has reversed its decision which recently resulted in the discharge of almost four hundred engineers engaged by the public service commission on the construction of the new subways with only a few hours' notice. This action caused strong protests from civic and business organizations and was the subject of a hearing by the engineering societies, at which the contractors and labor unions were represented. The discharge was due to the failure of the board of estimate and apportionment to appropriate a sufficient sum for their salaries and expenses for the year 1919. The board has now authorized the commission to reestablish the roll in force on Dec. 31, and an appropriation was made to maintain this organization during February and March or the remainder of the current quarter. All those discharged, most of whom were engineers, have been reengaged by the commission, with the exception of some who had taken positions elsewhere.

Service-at-Cost Plan for Minneapolis.

Minneapolis, Minn.—A draft of the proposed service-at-cost franchise for the Minneapolis Street Railway has been submitted to the committee of the city council on street railway matters by city attorney C. D. Gould and Stiles P. Jones, who were retained by the city as franchise experts. The basis of the proposal is service at cost, starting with a 5-cent fare with universal transfers plus a division of earnings between the city and the company and complete city supervision over service and extensions. The proposed franchise will be considered by the committee in a series of weekly meetings. At its last meeting the committee decided to take the C. L. Pillsbury valuation of $24,346,113 on the company's property, and allow the company 7 per cent earnings on that valuation, instead of on the $25,914,307 figure fixed by city engineer F. W. Cappelen. The fundamental purposes of the franchise grant, as stated by the two experts, are as follows:

To furnish the Minneapolis public with adequate railway service at all times, at a rate of fare sufficient to provide the facilities for such service, meet the legitimate costs of operation, maintain the property continuously in first-class condition and pay the company its fixed minimum return upon investment.

To provide for effective public control of service and extensions.

To provide for such public supervision of the property as will assure honest, efficient and economical management in the public interests.

To provide for an equitable division of the surplus earnings between the city and the company.

To provide for the purchase of the property by the city, and the terms, times and conditions thereof.

Some important provisions of the grant are as follows:

The company shall surrender its present franchise and waive all rights thereunder upon the taking effect of this ordinance.

The city shall have the right to purchase upon agreed valuation and subsequent additions giving one year's notice of its intention to purchase, at expiration of any five-year period.

The fare shall be 5 cents, with universal transfers; children under six years of age, free. Policemen and firemen may ride at reduced rates, as provided by the state law.

The company may adopt reasonable regulations governing the use of transfers, subject to the approval of the city council.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Extra Work Contract—Authority of Engineer.

(Pa.) A provision in a contract with a city for a public improvement that the decision of the city engineer shall be final in all disputes between the parties, and that he shall determine the amount or quantity of the several kinds of work which are to be paid for and the compensation, will not prevent submission of an action to recover for extra work to the jury, where the issue as to whether the engineer acted within the authority conferred on him by the contract was involved.—Ahrens v. City of Reading, 104 A. 511.

Misrepresentation Made by Municipal Agent—Responsibility of Town.

(Me.) A municipality may be made responsible for misrepresentations made by its agent to induce one to enter into a contract with it.—Prest v. Inhabitants of Town of Farmington, 104 A. 521.

Assessment for Highway—"Original Construction."

(U.S.C.C.A.Ky.) Where a highway has been constructed by certain municipalities, and taxpayers have contributed to its cost in order to complete the improvement, the main expense having been borne through a bond issue, and not by the abutting lot owners, the construction was not an original one, under Ky. St. section 3564, so that on the passage of an ordinance to improve such highway, the cost may be imposed as for "original construction" upon abutting landowners, instead of upon taxpayers generally, under section 3565.—Ludlow v. City of Ludlow, 252 F. 559.

Sewer Assessment—Abutting Owner.

(Iowa.) Where sewer was constructed to commence 13 feet farther than point fixed by city council's resolution of necessity, thus making assessed owner's property abut upon it, which otherwise it would not have done, though it might still have been deemed adjacent to improvement, the council could assess the property under Code, sections 819, 920.—Williams v. City of Cherokee, 169 N. W. 110.

Construction of sewer beyond point fixed by resolution of city council, thus causing assessed owner's property to abut on sewer, was not prejudicial to her, unless such method was adopted to fix liability to which she otherwise would not have been subject.—Id.

Unopened Street—City Liability for Injuries.

(Va.) City is not required to open all its streets for public travel, and its liability for injuries to pedestrian does not attach as to street neither accepted, opened, nor improved; but, if city permits use of street as such, though without improving it, it is liable.—City of Roanoke v. Sartini, 96 S. E. 763.

Where land company platted street, and city graded on both sides of excavation, exercised acts of ownership, and erected street signs, pedestrians using street, though for vehicles it was impassable in part on account of excavation, city accepted street as highway, and was liable for negligence causing injuries to pedestrian.—Id.

A city, by mental reservation of officials, cannot segregate small section of continuous street, and avoid customary obligations to keep in proper repair, etc., the part so reserved; it must give public notice of reservation, as by erection of barrier, etc.—Id.

Street Improvement Assessment on Industrial Property.

(Ill.) In establishing new highways, extent of use of old and new, and probable effect upon routes of travel of new highways, should be considered in determining effect upon property.—City of Chicago v. Farwell, 120 N. E. 520.

In proceeding to assess upon dock and canal company part of cost of street improvement, company's proposed finding that others using streets and bridge for like purposes would share advantages with occupants of objecting property was immaterial.—Id.

That industrial property sought to be assessed for part of cost of street improvement is not contiguous to particular street or bridge, and will not be to proposed improvement, is not material, except as to amount of benefit, and it is properly assessed if it does receive some benefit increasing market value.—Id.

Cost of entire street improvement was properly assessed against all property benefited, in proportion to benefit, and proper mode to find amount of benefits was not to deduct from total cost of improvement cost of acquiring land which objecting property owner claimed was unnecessary for improvement that would benefit its property to maximum.

Object of city's proceeding to assess cost of street improvement is to assess whole cost of entire improvement upon all property benefited; the fact that parts of improvement only were beneficial to certain property not freeing it from liability for its proportion of cost of other parts of improvement not beneficial to it.—Id.

If benefit to property from street improvement is less or greater because derived from some particular element of improvement, the fact must be considered in determining proportional amount of cost the particular property should bear.—Id.

City Contracts Specifying Stone Cutting in City—Lowest Bidder.

(Pa.) Ordinance of city of Philadelphia, requiring contracts for construction of public buildings to specify obligation of departments to have stone cutting done in city and that proposals shall so specify, violates Act May 23, 1874 (P. L. 230), in so far as compliance would result in award to other than lowest responsible bidder.—Taylor v. City of Philadelphia, 104 A. 766.

Recovery by Subcontractor on Principal's Bond.

(N.C.) A subcontractor of sewer work, on the failure of the principal to pay for work done, may recover on the principal's bond, given pursuant to Laws 1913, c. 150, as amended by Laws Ex. Sess. 1913, c. 9, and Laws 1915, c. 191, requiring a bond conditioned for the payment of all labor done; such bond covering the very work contemplated by the subcontractor, which the principal contracted with the city to furnish at his own expense.—Scheflow v. Pierce, 97 S. E. 167.

Damages Caused by Street Grading—Offset by Increased Values.

(Ga. App.) An increase in value resulting from improvement may be set off against damage caused by grading of streets. —City of Savannah v. Williamson, 97 S. E. 104.

Reconstruction of Improved Street—Assessment—"Roadway."

(Cal.App.) Under Vrooman Act, section 20, relating to street improvements, once a street has been accepted, it must thereafter be both repaired and improved by the city, so that subsequently property owners cannot be assessed for constructing therein a new kind of pavement, gutter, or curb.—Barber Asphalt Paving Co. v. Abrahamson, 175 P. 490.

An ordinance whereby a city accepted a roadway was not in contravention of Vrooman Act, section 20, because it excepts therefrom a portion required by law to be kept in repair by a railroad company, when read in connection with Civ. Code, section 498.—Id.

Under Vrooman Act, section 20, relating to street improvements, curb is to be included within the term "roadway," so that acceptance of roadway includes the curbing.—Id.

Where a city had no authority to lay down at the expense of property owners a new street in place of one accepted under Vrooman Act, section 20, the condition of the street at the time of the adoption or resolution of intention was immaterial to the jurisdiction of the council to order the construction of the new street.—Id.

NEWS OF THE SOCIETIES

Feb. 25-28, 1919.—AMERICAN ROAD BUILDERS' ASSOCIATION. Sixteenth annual convention and Ninth American Good Roads Congress under the auspices of the A. R. B. A., Hotel McAlpin, New York, N. Y. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

March 12.—VERMONT SOCIETY OF ENGINEERS. Annual meeting, Burlington, Vt. Secretary, Geo. A. Reed.

March 25, 26.—AMERICAN WATER WORKS ASSOCIATION, ILLINOIS SECTION. Eleventh annual meeting, Urbana, Ill. Secretary, G. C. Habermeyer, acting chief, State Water Survey, Urbana.

April 14-19.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Mineral Wells, Tex. Secretary, F. A. Rountree, Birmingham, Ala.

April 25-26.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE, Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, Logan Hall, West Philadelphia, Pa.

Nov. 12-14, 1919.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

AMERICAN ROAD BUILDERS' ASSOCIATION.

The sixteenth annual convention of the American Road Builders' Association will be held at the Hotel McAlpin, New York City, Feb. 25 to 28. The opening session will be held on Tuesday, Feb. 25, at 10.30 a. m. The address of welcome on behalf of the state of New York will be given by Francis M. Hugo, secretary of state. The address of welcome on behalf of the city of New York will be delivered by Robert L. Moran, acting mayor and president of the board of alderman. The address of welcome on behalf of the commission of highways of the state of New York will be by Edwin Duffy, commissioner. Response in behalf of the American Road Builders' Association will be by Arthur H. Blanchard, president. The following papers will be read:

"Operations of the Bureau of Public Roads Under the Federal Aid Act," by P. St. J. Wilson, acting director, United States Bureau of Public Roads.

"Building for the Future," by Andrew H. Phelps, secretary of the eastern district, Chamber of Commerce of the United States of America.

Tuesday, Feb. 25, 2.00 p. m.

"Efficiency of Bituminous Surfaces and Pavements Under Motor Truck Traffic," by Prevost Hubbard, chemical engineer, United States Bureau of Public Roads.

"Present Status of Brick Pavements Constructed with Sand Cushions, Cement Mortar Beds and Green Concrete Foundations," by Major W. M. Acheson, division engineer, New York state commission of highways.

"Recent Developments in the Construction, Maintenance and Reconstruction of Cement-Concrete Pavements," by A. D. Williams, chairman, state road commission of West Virginia.

Tuesday, Feb. 25th, 8.00 p. m.

Motion pictures by The Barrett Company, Granite Paving Block Manufacturers' Association of the United States, Koehring Machine Company, National Paving Brick Manufacturers' Association, Portland Cement Association and Warren Brothers Company.

Wednesday, Feb. 26, 9.30 a. m.

"Efficient Methods of Contracting for Highway Work During the Reconstruction Period," by John H. Gordon, president, New York Road Builders' Association.

"Street Systems, Their Relation to Highways Outside of Urban Districts," by Nelson P. Lewis, chief engineer, board of estimate and apportionment of New York City.

"Cost Keeping for Highway Contractors," by H. P. Gillette, editor-in-chief, "Engineering and Contracting."

"Foundations for Heavy Horse-Drawn and Motor Truck Traffic," by C. M. Pinckney, chief engineer of highways, borough of Manhattan, New York City.

Wednesday, Feb. 26, 2.00 p. m.

"Economic Utilization of Labor Saving Road Machinery," by Charles M. Upham, chief engineer, Delaware state highway department.

Report of committee on "Convict Labor on Highway Work: Organization, Administration, Camps and Cost Data," chairman, G. P. Coleman, state highway commissioner of Virginia.

Report of committee on "Sources of Supply of Unskilled Labor for Highway Work," chairman, Paul D. Sargent, chief engineer, Maine state highway commission.

Wednesday, Feb. 26, 7.00 p. m.

Annual A. R. B. A. stag-dinner, grand ballroom of the Waldorf-Astoria Hotel, Fifth avenue and Thirty-fourth street. Tickets, at $4.00 a cover, may be obtained at the registration headquarters. (Note: It is requested that business suits be worn at the dinner.)

Gen. T. Coleman du Pont will preside. The dinner will be followed by an entertainment provided by the local entertainment committee.

Thursday, Feb. 27, 9.30 a. m.

Joint session of American Road Builders' Association, American Automobile Association, Highway Industries' Association and National Highway Traffic Association.

Report of committee on "Methods of Strengthening and Reconstructing Highway Bridges for Heavy Motor Truck Traffic," chairman, Willis Whited, bridge engineer, Pennsylvania state highway department.

Report of committee on "Reconstruction of Narrow Roadways of Trunk Highways with Adequate Foundations and Widths for Motor Truck Traffic," chairman, H. E. Breed, first deputy highway commissioner of New York.

Report of committee of the National Highway Traffic Association on "Regulations Covering Speed, Weight and Dimensions of Motor Trucks," chair-

(*Continued on page 171*)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

PAVING IMPROVEMENTS are to be made by the cities of Columbus, Wis., according to plans prepared by the consulting engineer, W. F. Reichardt.

WATERWORKS and SEWERAGE IMPROVEMENTS are to be made by the city of Bayard, Neb. Plans were prepared by the consulting engineering firm of Slezer & Finley.

Poinsett county, Harrisonburg, Ark., will receive bids in March for ROAD CONSTRUCTION. The plans were prepared by the consulting engineering firm, the Morgan Engineering Co.

Jersey City, N. J., has advertised for bids for the construction of a WATER MAIN under the Hackensack and Passaic rivers, according to plans prepared by the consulting engineer, Laurence A. Ball.

Hastings Drainage District, Hastings, Fla., has advertised for bids for the construction of a DRAINAGE SYSTEM, involving 526,062 cubic yards of open ditch and concrete and wooden bridges. The consulting engineers are Ellis, Curtis & Kooker.

Newmarket, Ont., plans to install a new WATERWORKS SYSTEM. The consulting engineers are the firm of James, Loudon & Hertzberg.

WATERWORKS IMPROVEMENTS are to be made by the city of Wewoka, Okla., according to plans prepared by the consulting engineering firm, the Benham Engineering Co.

The WATERWORKS situation in New Rochelle, N. Y., is to be investigated by Farley Gannett, member of the consulting engineering firm of Gannett, Seelye & Fleming.

Oxnard, Cal., is contemplating the installation of a municipal GAS PLANT, the estimated cost of which is $140,000. The firm of Olmsted & Gillelen and Jos. M. Berkeley are the consulting engineers.

WATERWORKS IMPROVEMENTS, including the laying of 30-inch cast iron water pipe under and across the Hackensack river to connect with the pipe lines of the city of Bayonne, N. J., are to be made by that city. The plans were prepared by the consulting engineer, Morris R. Sherrerd.

INDUSTRIAL NEWS

The Iron and Steel Situation.

The industry seems to approaching definitely the opinion that there must be substantial reductions in prices in the near future. While it has been realized that a well-distributed demand for steel products could not be expected at anything like war-time prices, it was thought that there would be a running demand of moderately fair proportions at high prices, particularly from those to whom time is an object.

There was a disposition to divide buyers into two classes, those who buy for immediate consumption, or for ordinary manufacturing operations, and those who buy for investment purposes, in other words, who put the steel into investment projects such as bridges, buildings, factories, power stations, and enterprises of that general class, where a large depreciation in value in the first year or two of the life of the operation would be a great handicap to successful competition with other enterprises of the same class, either older or newer.

It was thought that the ordinary everyday buyers would continue to buy, no matter what the price, while the investment buyer was not ready to buy, no matter how low steel prices might descend. Hence it seemed to be sound policy to maintain prices, or maintain them approximately, until the "investment buyer" was seen to be ready. This policy, however, is now seen to be working out quite unsatisfactorily. The everyday buyer is buying very sparingly, and the sum total of all buying is extremely light.

One difficulty the steel producers see, however, is that any particular reduction, whether of $2 a ton or $20 a ton, would not stimulate buying at the outset. There is no price cut that any one could recognize as the final cut, because nobody knows just where the cost level lies, not even the producer, let alone the consumer, and even then there is no guarantee that a cut down to cost would not be followed by a cut below cost.

There are definite rumors that some leading producers contemplate a reduction of about $4 a ton in some leading products.

The most remarkable thing in the steel business is the heavy rate of production as contrasted with the demand. All producers have been describing the demand for weeks past as very light, yet the mills have been able to operate at a very fair rate. This means that stocks must be kept up.

While export demand does not measure up to the expectations entertained a few weeks ago, it has improved distinctly in the past week or two. There are many inquiries, although individual inquiries do not represent large tonnages. In this connection, it is interesting to note, that in the organization agreement of the Consolidated Steel Corporation, recently organized by independent steel concerns to promote export trade, is an item requiring each of the constituent companies to hold 10 per cent of its output at the call of the export company.

In relation to any extensive price reduction, producers must, of course, consider the present high wage scale.

A few steel producers have been suggesting that further reductions in steel prices should not be expected without wage reductions being made at the same time. Whatever may be the theories and desires as to wages paid by the steel industry, there is absolutely no prospect that any serious effort will be made to reduce wages this side of July 1 at the earliest. Word seems to have been passed around that the subject might as well be held in abeyance for that length of time at least.

Cast-iron-pipe.—The pipe situation seems to be improving, as far as volume of business is concerned, municipal inquiries increasing noticeably. Prices remain as follows: Chicago—4-inch, $64.80; 6-inch and larger, $61.80; class A, $1 extra. New York—4-inch, $65.70; 6-inch and larger, $62.70; class A, $1 extra.

Wallace & Tiernan Co., Inc., 349 Broadway, New York City, manufacturers of "W. & T." chlorinating apparatus, has recently appointed David Morey, jr., southwestern representative. Mr. Morey is located at 507 Scollard Buldg, Dallas Tex.

The Brown Hoisting Machinery Co., Cleveland, O., has issued a comprehensive new catalog featuring "Brownhoist" locomotive cranes. After enumerating the uses of this equipment and describing the construction of the various parts, the catalog presents about two hundred photographs of installations. These illustrate buckets (grab and dragline); coal and coke handling; construction work; 3 to 5 ton cranes; 30 to 40 ton cranes; dock, dragline, excavating, wharf work-crane and special cranes, including steam, electric and gasoline-driven, lumber handling, magnet work, ore handling, pile-driving, sand and stone handling, shipbuilding, etc. The installations include domestic and foreign. Among the most interesting are those showing cranes at work for contractors, public utility plants and on docks.

NEWS OF THE SOCIETIES

(*Continued from page* 170)

man, George H. Pride, president, Heavy Haulage Company.

Thursday, Feb. 27, 2.00 p. m.

Joint session of American Road Builders' Association, American Automobile Association, Highway Industries' Association, National Highways Association and National Highway Traffic Association.

Motion picture "Ocean to Ocean by Motor Truck," by H. S. Quine, secretary to the president, The Goodyear Tire and Rubber Company.

"Interrelationship of Highways, Railways and Waterways," by George H. Pride, formerly member Highway Transport Committee, Council of National Defense.

"National Highways," by Gen. T. Coleman du Pont, chairman, Board of National Councillors, National Highways Association.

Report of committee on "National Highways," chairman, Edward J. Mehren, editor, "Engineering News-Record."

Friday, Feb. 28, 9.30 a. m.

Report of committee on "Civil Service Requirements for Highway Engineering Positions," chairman, H. G. Shirley, secretary, Highway Industries' Association.

"Efficient Methods of Promoting Highway Bond Issues," by S. E. Bradt, state superintendent of highways of Illinois.

Report of committee on "Methods of Financing Highway Improvements for States, Counties and Towns," chairman, Nelson P. Lewis, chief engineer, board of estimate and apportionment of New York City.

Report of committee on "Economic Status of Guarantees for Pavements on Roads and Streets," chairman, Francis P. Smith, consulting paving engineer, New York City.

Friday, Feb. 28, 2.00 p. m.

"The Motor Vehicle in Warfare" (illustrated), by John R. Eustis, secretary, Motor Truck Board, American Automobile Association.

Report of committee on "Uniform Highway Signs," chairman, Robert A. Meeker, consulting engineer, Newark, New Jersey.

Report of committee on "Efficient Methods of Snow Removal from Highways Outside of Urban Districts," chairman, Charles J. Bennett, highway commissioner of Connecticut.

"Methods of Maintaining Highway Systems to Construction by the State of County," by Frederick E. Everett, commissioner of highways of New Hampshire.

Business session of the American Road Builders' Association.

Report of resolution committee.

Indiana Engineering Society.

The annual convention of the Indiana Engineering Society was held Jan. 23, 24 and 25 at Indianapolis.

"The Concrete Road and Its Mission" was the subject of the first paper which was read by C. D. Franks, of Indianapolis, engineer for the Portland Cement Association. M. T. Calef, highway engineer, of South Bend, delivered an illustrated lecture on "Better Cost Keeping for Highways"; A. W. Grosvenor, of Ft. Dayne, county surveyor of Allen county and president of the County Surveyors' Association, spoke on "Problems of the County Sur-

veyor," and "Highway Extension at Purdue University" was the subject of an address by R. C. Yoeman, associate professor of highway engineering at Purdue. The session closed with a general discussion of the county unit highway bill.

The economic welfare of the engineer was the general topic of discussion Thursday evening. The Indianapolis chapter of the American Association of Engineers participated in the meeting. W. H. Finley, of Chicago, president of the American Association of Engineers, who was to have delivered an address, was unable to appear because of illness.

A bill before the legislature for the licensing of architects and structural engineers in Indiana was outlined by H. O. Garman, chief engineer for the public service commission. This bill, Mr. Garman said, provides for an examining board of five members—two architects, two structural engineers and one member who shall not belong to either class. Separate examinations for architects and engineers are to be given, but the holder of either license may practice in both fields. An original license fee of $50 is required with an annual renewal fee of $10.

To prevent hardship, the bill contains a clause by which all architects and engineers now practicing in the state may obtain a license within six months after the enactment of the law without examination. The definition of architectural or structural engineering is the planning, designing or supervision of the erection, enlargment or alteration of buildings, or any part thereof, for others, and to be constructed by persons other than the engineer.

Provision is made for issuing licenses without examination to architects of other states which have similar laws and to members of any organization which has high requirement for membership. After paying the expenses of the commission, it is said, the law would result in a considerable income to the state, though the benefit to the public in the safeguarding of life, health and property would far exceed the revenue to the state value.

The part played by the engineer in the world war would have been even greater and more brilliant than it has been if the profession at the outbreak of hostilities had been organized as were physicians and surgeons, said Charles E. Drayer, of Chicago, secretary of the American Association of Engineers, in speaking on the co-ordination of various branches of the profession.

A plan for placing municipally owned public utilities in Indiana cities under the control of non-partisan boards and providing civil service rules for employees in such plants was presented to the society by John W. Mueller, of Richmond, chairman of the society's legislative committee, and a bill to carry out the plan will be drawn and presented to the legislature.

The public utility situation in Indiana is clearing up rapidly, and improvement of service and abolition of war surcharges may be expected before long, said H. O. Garman, chief engineer of the Indiana public service commission, in an address delivered at the Friday afternoon session.

Central heating plants were sorely pressed during the war, gas concerns suffered greatly, street railway and interurban line investments are seriously impaired and water supply utilities have sustained some losses, Mr. Garman said. Telephone utilities have suffered least of all from war conditions, he asserted. "Central station heating plants were sorely pressed, both hot water and steam plants; many of them would have abandoned service entirely if the commission would have permitted it and if it could have been done without causing suffering to their patrons. None of the thirty-seven heating plants in Indiana made a fair return on their fair value, and by agreement three of them have abandoned service permanently, and there are several others that were offered as a gift, in public hearing before the commission, to any one, but without a taker. The central station heating business has suffered terribly from poor management and high prices, and the rates have reached the point where they are nearly prohibitive. Next to the heating plants, the gas plants were affected by a shortage of labor, zoning out of coal, poor gas coal substitutes, high prices and poor management. New gas standards are now being developed in collaboration with the United States Bureau of Standards. There is no doubt but that the B. t. u. standard must come down. Water supply utilities have suffered only the usual war increases in cost of purification materials, coal and labor, and when normal prices are restored they will be back nearly to a pre-war basis. New economic conditions are facing the street railways and interurban railways, and the safety of the investments are being seriously impaired. The end is not in sight. They are confronted with increasingly higher taxes, they are being paralleled with market highways and heavy construction carrying vehicles in competition to them, and they are suffering the high operating costs that all other public utilities have met with."

The society indorsed a proposed bill to create a non-partisan board of control for municipaliy owned public utilities and to provide for employment of all help in such utility plants by civil service rules. The bill will be drafted and supported by representatives of the engineering society. The purpose of the proposed legislation is to prevent financial loss to taxpayers through incompetent handling of municipally owned utilities. The bill will provide for the appointment by the mayor of a city of one director for any publicly owned utility after a petition, signed by 25 per cent of the city's voters, requesting such action, has been presented. Following the appointment of this one director, the state public utilities commission would name a second director and the two would select a third. The directors would draw nominal salaries and would employ a manager who would be responsible for the operation of the plant. The directors would decide questions of finance and policy.

Other bills indorsed by the engineering society, on recommendation of the resolutions committee, were: A bill providing for the licensing of structural engineers and architects, the new state highway commission bill, a bill setting a new standard of qualifications and salaries for county engineers, the tax commission bill and the full suffrage for women bill. The society went on record as opposed to any measure that might restrict the authority and activity of the Indiana public service commission.

A banquet was held Friday evening. Frank J. Pollay, a special agent of the department of labor, declared that the United States, under pressure of war conditions, accomplished in two years a survey of its resources such as was made in Germany by the German government in fifty years. Other speakers were: Professor Frank C. Wagner, of Rose Polytechnic Institute; Samuel E. Greeley, of Chicago; D. D. Ewing, of Lafayette; F. F. Chandler, of Indianapolis, and A. W. Grosvenor, of Ft. Wayne.

The following papers were read at the Saturday morning session: "Psychological Methods for Selection of Soldiers, Officers and Employees," by Professor C. F. Harding, of Purdue university; "Efficiency Engineering in Industrial Plants," by J. E. Hannum, of Indianapolis; "The Year's Progress in Electrical Engineering in the Allied Fields," by Professor D. D. Ewing, of Purdue university; "Some Recent Technical Developments in Telephony," by Professor R. V. Achatz, of Purdue university; "Electrical Pumps in Municipal Water Works," by Prof. D. D. Ewing, of Purdue university; "The Decimal Versus the Dozen System of Writing Numbers," by John D. Riggs, of Indianapolis.

The following officers were elected for the year: G. A. Young, Purdue, president; Charles Cheney, Indianapolis, former county surveyor of Marion county, vice-president; R. P. Wiley, Purdue, trustee; F. C. Wagner, Rose Polytechnic, and E. S. Pearse, Indianapolis, trustees for two years. W. H. Insley, Indianapolis, and John T. Wilkin, Connersville, are holdover trustees.

Boston Society of Civil Engineers.

The following nominations for office have been proposed by the nominating committee of the Boston Society of Civil Engineers:

President, Leonard Metcalf; vice-president, Robert Spurr Weston; secretary, S. Everett Tinkham; treasurer, Frank O. Whitney. The election takes place March 10.

Municipal Journal

Volume XLVI NEW YORK, MARCH 1, 1919 No. 9

LANCASTER'S REMODELED PUMPING PLANT

Changed from a Steam to an Electric Plant—Cost of Operating Plant Reduced One-Third—Details of Pumps, Motors and Other Equipment—Result of Test of Pumps.

By JOHN T. BRAINARD.*

THE THREE LOW-LIFT ELECTRIC PUMPS.

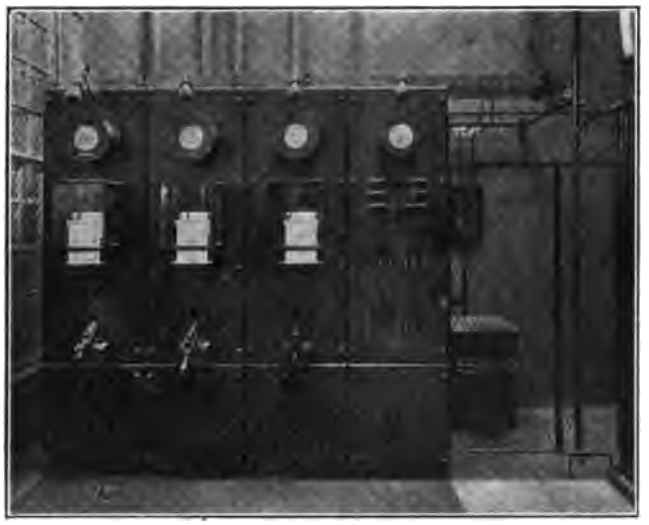
The municipal water plant of Lancaster, Pa., obtains its supply of water from the Conestoga river, which has a watershed of more than three hundred square miles above the city and has a minimum flow of forty million gallons per twenty-four hours. The water is filtered and is pumped into a reservoir, while the high service of the city is supplied from a standpipe. The filtration plant was installed in 1905 and the efficiency of its operation has never fallen below 98 per cent.

Until a little over a year ago the water was pumped by means of one six-million and one ten-million gallon Worthington pump and one twelve-million gallon R. D. Wood of the horizontal type, these three pumps having been built in 1890, 1893 and 1903 respectively. In April, 1915, the people voted $125,000 for converting the pumping plant into an electrically operated one, and for some improvements in the distribution system. Plans for the plant were perfected and the city council awarded contracts on April 1st, 1916, and construction work began in the fall of that year. A considerable part of the work of removing the old pumps and remodeling the building was done by municipal employes under the superintendent of the water department, Charles K. Will, thereby effecting a large saving in the cost to the city.

All of the work was completed within the appropriation and without increasing the city taxes or the water rates. On the other hand, if the city were using steam this year for pumping, an increase in either water rates or taxes would certainly have to be made; but as it is, the water committee has decided not to make any change in the rates for the present, the charge being five cents per thousand gallons.

During 1917, while transition was being made from one system to the other, the cost of neither could be determined with any accuracy. The cost of electric operation during 1918, however, can be compared with steam operation during 1916. The cost of operation during 1918, when 2,686.8 million gallons was pumped by electricity, was $42,821.72, while in 1916, 2,569.37 million gal-

*Secretary of Water Department, Lancaster, Pa.



POLYPHASE WATTHOUR METERS; GRAPHIC METERS.

lons pumped by steam at a cost of $54,903.76. Fourteen men were employed at the plant in 1916, but only eight men in 1918. The receipts for 1918 were $193,265.12 and those for 1916 were $173,942.53. The average pumping so far this year has been at the rate of 7,950,000 gallons per day, the total pumping capacity being 23,000,000 gallons.

The new machinery contracted for comprised five high-duty pumps, three low-duty pumps and two vacuum pumps that were furnished by the Earle Gear and Machine Works, the cost being $60,590; electric motors and other equipment furnished by the Westinghouse Electric & Manufacturing Co. for $32,828; the electric wiring was let to the Lord Electric Co. for $6,233, and the contract for the pipes and special castings to the Standard Cast Iron Pipe and Foundry Co. at 2½ cents and 8 cents per pound respectively.

The high-duty pumps are centrifugal, two-stage, direct-drive, two of 5,000,000 gallons a day capacity, two of 4,000,000 gallons, one of 3,000,000 gallons, giving a combined rated capacity of 21,000,000 gallons. This amount can be considerably exceeded, however, as on several occasions the two 4,000,000 gallon pumps alone have pumped 11,000,000 gallons. These pumps work against an average head of 240 feet.

The three low-duty pumps are centrifugal, single-stage and are used for pumping water from the receiving basin into the filtration plant against a head of approximately 44 feet.

The five-million-gallon high-duty pumps are driven by 300 h.p. motors, the four-million-gallon pumps by 250 h.p. motors and the three-million-gallon pump by a 200 h.p. motor. One of the motors driving the low-duty pumps is 100 h.p. and the other two are 75 h.p. A 10 h.p. motor drives the machinery in the machine shop and two 1 h.p. motors are direct connected to two vacuum pumps that are used for priming the low-duty pumps.

The slip-ring motors for the high-duty pumps are started and controlled by Westinghouse magnetic switch-type automatic controllers, which start by cutting resistance out of the secondary of the motor. Interlocks definitely determine the rate at which the motor is brought up to speed. A four-panel board controls the two large pumps and a six-panel board controlls the four-million-gallon and three-million-gallon pumps.

The low-duty pumps are started by auto-starters or compensators for reducing primary voltage. The vacuum pumps are started by a simple single-throw switch. The master circuits to the control for the high-duty pumps are duplicated in the engineers' quarters and any or all can be started or stopped from either that point or from the main board.

Current for operating the plant is obtained from the Edison Electric Co. and is transmitted from a separate panel at a sub-station by a duplicate three-phase line, which for a considerable part of the way is supported on latticed steel towers and follows a right of way especially chosen because of its freedom from possible interruptions. At the entrance to the waterworks grounds is located an iron frame supporting duplicate sets of electrolytic lightning arresters with their accompanying choke coils, hook switches and horn gaps. After passing through the choke coils, the energy is brought into the transformer room by duplicate lead-encased high-tension cables.

The transformer room contains 400-kva., single-phase transformers, 11,000 volt primary and a combination secondary suitable for 2,300 or 575 volts, the latter being used at present. There is also a 10-kva. transformer from 575 to 230-115 volts for lighting the plant and also a large electric sign containing 570 lamps located on the roof of the plant and containing the words "Lancaster, Pa., Waterworks Pure Filtered Water."

A panel with the necessary meters, circuit breaker, with over-load time-limit relays, controls the high-tension buss to the transformers. A four-panel board controls the three power circuits and the lighting circuits. One panel controls the 300 h.p. pumps and another the remaining three high-lift pumps, while a third serves the low-lift pumps, the machine shops and vacuum pumps.

Of the original steam plant, the 12-million-gallon steam pumps with its boilers and two 10-million turbines are retained for an emergency.

Should the current fail from any cause, connection can be made very quickly with the Baltimore steam plant, or the 12-million-gallon steam pump can be put into service, steam being kept up at ten pounds in the boilers at all times.

Since pumping had to be continued during the change from steam to electric power, it was not possible to dismantle all of the steam plant until a corresponding capacity of electric pumps were ready and connected up for operation. Apparently the only thing to do was to build an addition to the building for the transformer room. After this room was well under way, the 6-million-gallon steam pump was dismantled, this work being

HIGH DUTY PUMPS, TWO OF FIVE MILLION AND ONE OF THREE MILLION GALLONS.

begun on March 19th, 1916, and finished on May 4th of that year. (This left the ten-million and twelve-million pumps to do the work.)

The old 6-million-gallon pump was removed by the employes of this department at a cost of $203.85, and the department realized from this pump a net profit of $559.16, in addition to which they retained for use many valuable gauges and valves. Concrete foundations were then constructed for the two 4-million-gallon electric pumps, and these were set in place. These two 4-million-gallon pumps started continuous operation on January 24, 1917. The pumps were tested by the contractors for the pumps and for the motors and the plant showed high efficiency, together pumping eleven million gallons in 24 hours. Following the completion and testing of these pumps, they were operated continuously, and, relying on their operation, the 10-million-gallon steam pump was dismantled, leaving only the two 4-million-gallon electric pumps and the 12-million-gallon steam pump to supply the city. These pumps were operated alternately, or together when necessary, and as on some days the average pumping exceeded twelve million gallons, the department realized that it was taking a chance, and asked the public to economize in the use of water, especially on Monday mornings when the draught is heaviest. The waterworks' employes completed the dismantling of the 10-million-gallon pump on March 3, 1917, this work having been done by them at a considerable saving to the city.

Following this, the three low-lift electric pumps and the remaining three high-lift pumps were installed and began active service. Since that date all the pumping of the water department has been carried on by the electric plant, and the steam equipment has not been used. It was certainly a relief when the three high-duty electric pumps were all in operation, and superintendent Will, the water committee and the mayor all slept better at night when the risk of a break-down was over. During the entire transfer from steam to electricity there was no interruption to the service.

Final tests were made of both high-duty and low-duty electric pumps on July 1, 1918. One 4-million-gallon pump pumped at a maximum rate of 5.47 million gallons per day and the other at a maximum rate of 5.10 million gallons; the former reaching a maximum efficiency of 77.4% at the maximum rate named while the second reached a maximum efficiency of 77.7% when pumping at its maximum rate. One of the 5-million-gallon pumps developed a maximum efficiency of 74.7% when pumping at the rate of 5.55 million gallons, the other 5-million-gallon pump reaching a maximum efficiency of 72.8% when pumping at the rate of 5.85 million gallons. The 3-million-gallon pump attained a maximum rate of 3.84 million gallons, at which its efficiency was 73.3%. Of the three low-lift pumps, the 7-million-gallon pump developed a maximum efficiency of 85.3% when pumping at the rate of 8.06 million gallons a day; the 6-million-gallon pump reached an efficiency of 87.2% when pumping at the rate of 6.37 million gallons per day; and the 5-million-gallon pump reached its maximum efficiency of 80.8% when pumping at the rate of 5.88 million gallons per day.

In connection with the new pumping plant, a number of improvements in appurtenances have been made. Foxboro recording gauges have been installed; a long-distance electric recording gauge has been installed at the standpipe a mile away, and a general recording system reports every ten minutes the height of water in the standpipe and the reservoir, and records the pressure every minute. A 24-inch Pitot recording meter has been installed to measure the raw water pumped to the filter plant, and since the installation of this meter very little water has been wasted in washing the filter beds. The entire plant is so equipped with meters and recording gauges that every 24 hours a record of the efficiency of operation of each item of the entire plant can be secured.

Many improvements have been made to the pumping station and to the reservoir and grounds, as well as needed improvements throughout the distribution sys-

MACHINE SHOP OF THE WATER DEPARTMENT.

tem. A new concrete storage house was included in the improvement at the waterworks plant. Six thousand feet of 16-inch water pipe was laid across the northern part of the city to supplement the 20-inch main artery on Orange street. As soon as a right-of-way can be obtained from the railroad company, this main will be continued across the tracks and connect with a 24-inch main for the purpose of increasing the pressure in the section just deyond this point. A large concrete building was constructed at the East End reservoir to house a booster pump and electrical equipment used for pumping water from the reservoir into the standpipe in order to keep up the pressure in the high service during a shut-down at the main pumping station.

FREIGHT RATES ON SAND AND GRAVEL.

Representatives of the National Association of Sand and Gravel Producers were in Washington last week endeavoring to persuade the Railroad Administration to reduce freight rates on sand, gravel, crushed stone and slag, and interested the Department of Labor in the matter. They advanced the arguments that this would stimulate public works, giving employment to laborers; provide use for an existing surplus of open-top cars; increase the revenue of the railroads; put idle capital in circulation, and give to contractors and producers of building materials a chance to recuperate some of the losses sustained by the necessary restrictions placed on construction work during the war.

The secretary of the association, E. Guy Sutton, says that there are thousands of open-top cars idle, because of the increased demand for coal, that could be used for hauling sand, gravel and broken stone; but that the rates created by General Order No. 28 are so high as to prevent the movement of these materials.

SOME LESSONS FROM FRENCH ROADS.

Macadam Roads as Built in France More Expensive Than Ours, but Could Not Withstand Our Traffic—Will Probably Fail There Soon.

By E. A. KINGSLEY, Major of Engineers.*

The American Expeditionary Forces have occupied various portions of middle and Southwestern France. It has seemed, at times, that the great Intermediate Section was being colonized by the United States troops. Hundreds of towns and hamlets were so thickly populated with these troops that one would often wonder, almost, whether he were in war-torn France or back in America. The dear old Stars and Stripes was as commonly seen in many communities as the Tri-color. And our flag is as well known to the French child as is his own.

Much in France has amused the 2,000,000 Americans sent over. Many of the customs have seemed strange. But to the alert and observing citizens of the big sister republic many lessons have been taught. The return of the army to the United States will bring new ideas, new thoughts and new customs.

Perhaps the most impressive thing with which every man in the army has been brought in close contact is the condition of French highways. Without these wonderfully built and maintained arteries of traffic, the first Battle of the Marne would have been lost to civilization. And had it not been for the excellent through and connecting roads, the 600 miles of "Lines of Communication" of the American Army could not have existed and the armies at the front in close touch with the Hun Devils would not have been maintained as they were. The realization of these facts has made just as many road boosters, enthusiastic improved-road advocates, as there are men and women in the army and its allied organizations.

In the enthusiasm over the French roads, it is possible that the returning citizens may unknowingly become overzealous. There can be no question as to the ability of the French road engineers, the "Ingenieurs des Ponts et Chaussees," in their design and as to their thoroughness in construction. The roads of France, after four years of war traffic, stand as a monument to these engineers and their system. To the American road engineers and the road contractors who have been with the American Expeditionary Force, the ability of these water-bound macadams to withstand the war traffic has been little less than marvelous. Especially is this true of those of us who came with the earlier forces in 1917 and have seen the roads under American traffic from the first until the close of 1918.

The connecting links, great macadamized arteries of traffic, from base ports to the front all passed through the largest of our sectional areas, the Intermediate Section. In consequence, these main roads were subjected to the heaviest of the American Army traffic excepting the concentrated traffic just back of the fighting line. The stretch of about 150 miles from Bourges to Dijon perhaps carried the greatest traffic in Service of Supply. Like most of the great roads of France, this was a macadamized road and may be taken as a model or pattern of the French type. The wearing surface is of as hard material as can be obtained within reasonable limits of expense. In some sections it is porphyry or granite; in others it is a hard blue rock resembling in some degree the blue traps of the United States, but more closely related to the schists. Through a few sections a gravel surface has been built. The predominating material, however, is lime-rock of varying degrees of hardness. Lime-rock is very plentiful in almost any section of Central France, and while much of it is too soft for a wearing surface, it answers well for a base and cheapens materially construction costs. Hard lime-rock is obtained in so many communities that the surfacing material is not expensive.

The terrific traffic these roads have been called upon to stand was almost beyond conception. Hundreds of trucks have moved rapidly over these roads carrying millions of tons of freight. And the word "moved" is used advisedly, for American drivers have seen that their trucks moved and moved rapidly. If the designer of some of the big army trucks in France could see the rate of speed at which the products of his fertile brain were moving freight in France he would start to work on a governor that could not be tampered with.

All of this has had a tendency to cause the average man to scratch his head in wonderment and say: "Why can not we in America, at comparatively small expense per mile, duplicate these wonderful French macadam roads?" Because of the wonderful results obtained by water-bound macadam in France, many men are going to return home to advocate going back to waterbound macadam in America. It literally would be a backward step. America can build macadam roads as good as the French roads, if she will, but it will not pay for a number of reasons.

In the first place, good stone for water-bound macadam is very prevalent in France, in nearly every section. Then, too, the climate of France is damp and moisture is nearly always in the atmosphere. These two conditions that make for good macadam roads in France, do

*Superintendent of Roads, Intermediate Section, American Expeditionary Forces, Nevers, France.

not exist, as a rule, in the United States. Recognizing that moisture is a necessity for the preservation of their roads, the French have planted trees everywhere in rows on each side of their roads. In some places they have planted two rows of trees. The traveler usually thinks, "How nice is this shade this warm day." But the engineer who planted the trees thought, "This will help bind and keep my road."

The cross-section of the French road is peculiar in design. On the extreme edges of the roadway or berm are ditches of sufficient size to care for the drainage. Between ditches, if the metal surface is to be six metres, the entire distance will be twelve meters; if the metal is five meters, then the width between ditches will be ten meters. Between ditches is double the width of the metal surface. But the metal surface is invariably in a trench. Excavation for the rock is made sufficiently deep so that when finished the road surface will be, at the shoulders, approximately ten centimeters (4 inches) lower than the surface of the berm.

American practice is to have the edge of the roadway and the berm at the same level. Most specifications require that in final rolling one wheel of the roller travels on the metal and overlaps on the berm. The French practice is expensive, first, because of additional excavation required. Then, every 20 or 25 metres a cross ditch to the main drainage ditch must be cut. This adds to the construction cost and certainly prevents any possibility, even in emergencies, of using any part of the berm for traffic. Again, the shoulder has a tendency to catch all of the dirt washed from the road's surface in wet weather. In one way this is not a bad scheme, as it prevents the main ditches from filling with this material. In maintenance work, this depressed roadway is more expensive, for the cross ditches must be kept open at all times. The collections of dirt along the shoulders must be taken care of, too, or the drainage scheme fails.

One point never overlooked is the drainage. On so many roads in America, the drainage question, while perhaps not overlooked, has been neglected. Not so with the French engineers. In the first place, the road is located with a view to drainage conditions existing or to be arranged. In the second place, adequate ditches are built and adequate culverts and undercrossings are provided. Then is the road built. And you don't find French roads washed out.

One thing in maintenance that has made for good roads in France has been the abundant and cheap labor. This has made the development of the cantonment system or patrol system of continuous repair possible. Then too, France is a country of short distances and small farms. The United States is just the reverse. France uses the oxcart and the big-wheeled wagon. The American farmer is going to tractors and automobiles. Waterbound macadam roads improve under the rolling of the big wheels of the French carts and wagons. They go to pieces under the rapid traveling of American cars and trucks, even with the favorable climatic conditions. All of these things have tended towards good macadam roads in France. After the war will it be so? Labor will be less plentiful. Thousands of the beautiful protecting trees have gone for war purposes. The automobile and auto truck will come into more general use. The macadam roads will then fail as they have failed in America.

Engineers who have specialized in road work and who know roads and conditions owe it to their country to teach the lessons they have learned in France. Many thousands of men who have seen these roads stand up under our traffic for a year will only be impressed thus far. They do not go deeper because they do not know. It is not an opportunity but a duty which confronts the road engineer. He, who has been in France and has seen, must return to preach and teach: "The day of waterbound macadam for American main highways is passed." The returning forces will be good-roads advocates, but in the enthusiasm for good roads and their praise for French roads, let them not forget that the problem cannot be solved by an off-hand comparison and a consequent conclusion. For American arteries of traffic, her main highways, macadam roads can never be successful roads. They will always be the most wasteful expenditure of public funds. It is now costing America thousands of dollars every day to repair the damage done the French roads during the year 1918. And the end is not in sight. For through roads carrying any considerable traffic, waterbound macadam will not suffice. And waterbound macadam roads are not permanent roads.

COAL CONSUMPTION IN CENTRAL STATIONS

Coal Consumption of 6¼ Tons Per Horse-Power-Year the Minimum—Load Factor More Important Than Size.

Research in the subject of the rate of coal consumption in various electric generating stations in Canada and the United States was conducted in 1917 and 1918 by the Hydro-Electric Power Commission of Ontario, the investigation including 73 stations. No stations were included that used wood, oil or any fuel other than coal for steam generation, nor those employed for standby or auxiliary purposes. Most of the figures are for the years 1912 to 1916 inclusive.

An arbitrary division of the plants was made into six classes as follows:

Class A includes stations up to 1,000 kw. capacity.

Class B includes stations from 1,001 to 5,000 kw. capacity.

Class C includes stations from 5,001 to 10,000 kw. capacity.

Class D includes stations from 10,001 to 50,000 kw. capacity.

Class E includes stations from 50,001 to 100,000 kw. capacity.

Class F includes stations above 10,000 kw. capacity.

There were three stations of class A, averaging 650 kw.; ten of class B, averaging 2,980 kw.; twelve of class C, averaging 7,230 kw.; eight of class D, averaging 24,600 kw.; one of class E, of 96,000 kw.; and one of class F, of 149,000 kw.

The more important items of information secured, averaged for each class are given in the table on the next page.

All of these plans were used for both lighting and power, while railways were operated by one of class A, three of class B, eight of class C, six of class D, and the plants of classes E and F.

Stoking. In class A, all three plants used hand stoking. In class B, three were hand-stoked and seven used mechanical stokers. In class C, one was hand-stoked, two both hand and mechanical, and the remaining nine mechanical only. In classes D, E and F mechanical stoking only was used.

Draft. In class A, all used natural draft. In class B, four used natural and six mechanical draft. In class C,

six used natural, one both natural and mechanical, and five mechanical. In class D, three used natural draft, and five mechanical. The class E plant used both natural and mechanical; and class F, mechanical.

Prime Movers. In class A, one plant used engines, one turbines, and the third used both. In class B, six used turbines only and four used both. In class C, five used turbines only, seven used both. In class D, turbines were used by six, both engines and turbines by two. Turbines only were used by classes E and F.

All the engines but five were condensing, and all the turbines but two.

All the plants operated 24 hours a day.

It appears that the average yearly load factor for Canadian central stations deriving their energy from coal through the medium of steam, is 30 per cent; the rate of coal consumption per h.p. year is 23 tons; the plant capacity is 134,000 h.p. The average rate of coal consumption works out to nearly 32 tons per h.p. year, so that 30 tons per h.p. year will serve very well as a round figure for general estimating purposes and is low rather than high.

For convenience it will be well to give this figure in various forms, thus:

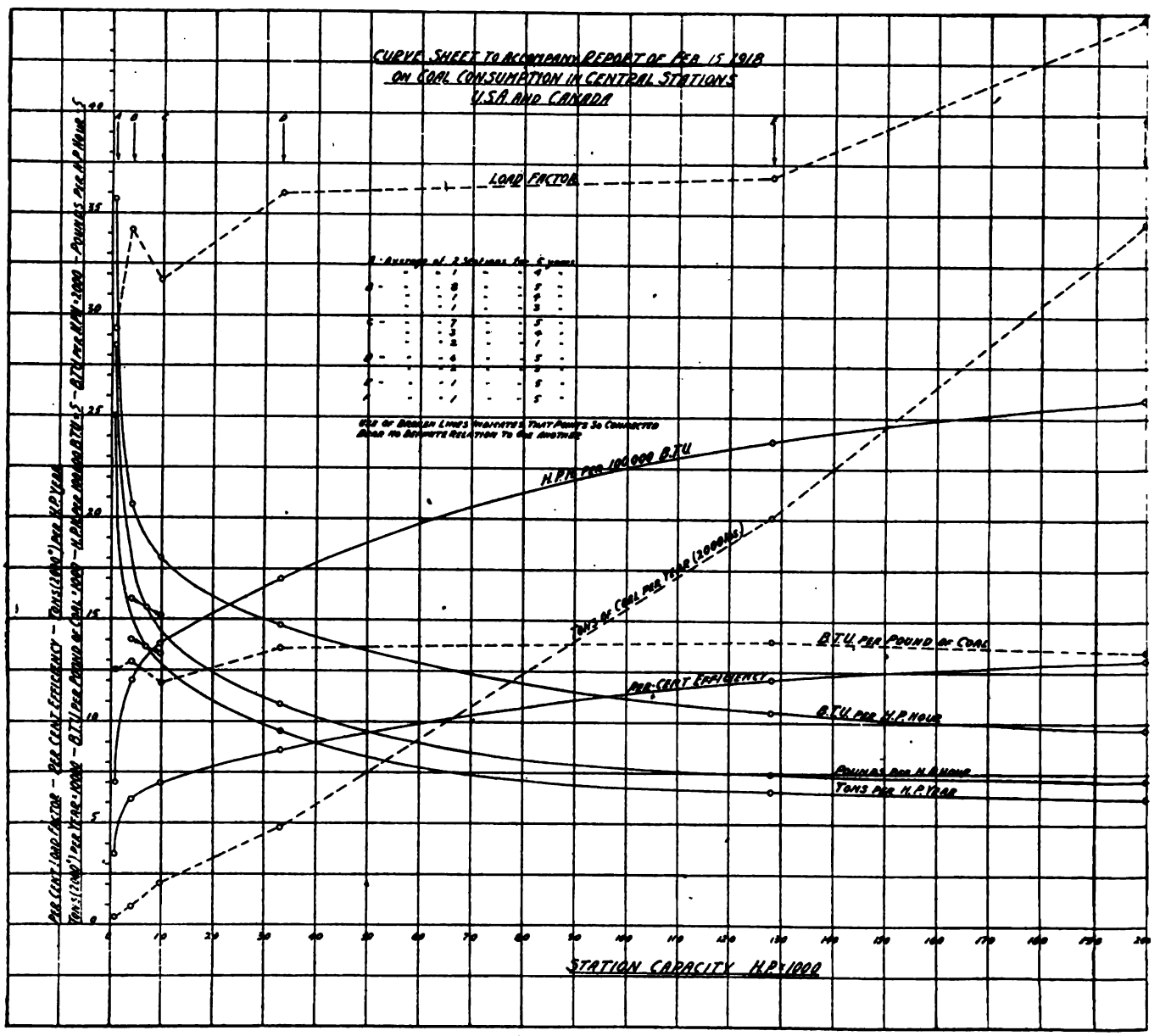
Lbs. per		Tons per	
K.W.H.	H.P.H.	K.W.Y.	H.P.Y.
9.2	6.85	40	30

Summing up certain other figures presented in the report, it appears that, for electric generating stations, using coal fired under boilers, such as are in actual operation in Canada and the United States today, the average

Data Concerning Plants, Averaged by Classes.

Class	Station Capacity K.W.	Station Capacity H.P.	Lbs. per K.W.H.	Lbs. per H.P.H.	Tons per K.W.Y.	Tons per H.P.Y.	B.T.U. per lb.	% Load Factor	% Efficiency*
A	650	870	7.65	5.70	34.60	25.10	12,500	29.3	3.5
B	2,980	4,000	4.30	3.20	19.00	14.00	12,900	34.2	6.2
C	7,230	9,700	4.07	3.04	17.80	13.30	11.900	31.7	7.0
D	24,600	33,000	2.91	2.17	12.75	9.52	13,600	36.0	6.6
E	96,000	128,800	2.01	1.50	8.80	6.57	14,000	36.9	12.1
F	149,000	199,500	1.92	1.43	8.40	6.26	13,500	44.7	13.1
All.... classes	46,340	62,600	3.81	2.84	16.90	12.46	13,600	35.5	8.4

*"Efficiency per cent" is the percentage of the efficiency of conversion of heat energy in the coal to electric energy at the switchboard.


CURVE SHEET TO ACCOMPANY REPORT OF FEB 15 1918
ON COAL CONSUMPTION IN CENTRAL STATIONS
U.S.A. AND CANADA
LOAD FACTOR
H.P.H. FOR 100,000 B.T.U.
TONS OF COAL PER YEAR (2000 LBS)
B.T.U. PER POUND OF COAL
PER CENT EFFICIENCY
B.T.U. PER H.P. HOUR
POUNDS PER H.P. HOUR
TONS PER H.P. YEAR
STATION CAPACITY H.P. 1000

AMOUNT AND EFFICIENCY OF COAL CONSUMPTION IN CENTRAL ELECTRIC STATIONS.

rates of coal consumption for various sizes of stations are as shown below:

Station Capacity K. W.	Rate of Coal Consumption Tons per H.P.Y.
Over 100,000	6.25
50,000 to 100,000	6.57
10,000 to 50,000	9.32
5,000 to 10,000	13.30
1,000 to 5,000	14.00
Under 1,000	25.10 and higher

Now, although it is true that, under very favorable conditions and in plants of the largest sizes, the rate of coal consumption may be as low as 6.25 tons per h.p. year, it is equally correct to state that, taking average existing conditions for electric generating stations in Canada, the rate approximates to 23 tons per h.p. year.

Several of the relations are shown by curves in the illustration, reproduced from the report. One interesting feature noticed is that the curve of coal consumption per h.p. year becomes practically horizontal at a station capacity of about 150,000 h.p., showing that with present equipment, methods of operation, load factors, etc., in the large generating stations, the rate of coal consumption cannot come below about 6.25 tons per h.p. year, no matter how large a station may be. Since the equipment now in use is getting near to the maximum possible efficiency this means that probably under no circumstances will it be possible to get below, say 5.5 tons per h.p. year. Centralization on a vast scale may tend to reduce costs but cannot conserve coal very much as compared with existing conditions in the large stations. At the same time it must be remembered that as the coal bill in a central station usually forms from 40 per cent to 60 per cent of the total costs, even comparatively small percentage savings on this item give high totals in money.

Another point to be observed from the curves is that, comparing stations of say 50,000 h.p. and 200,000 h.p. capacity respectively, it is found that the rates of coal consumption are 8.6 and 6.26 tons per h.p. year, showing a saving of approximately 25 per cent for the larger station. The respective load factors are, however, 36.2 per cent and 44.7 per cent respectively, and there is no doubt that if the smaller stations were operated at the same load factor as that obtained in the larger station the difference in the rates of coal consumption would be much smaller than that given above (excluding other disturbing factors such as the use of poor coal), and emphasizes the fact that the very large stations do not tend to make very big reductions in rates of coal consumption as compared with those of more moderate size.

It is evident from these considerations that coal can be better conserved by appreciably increasing the load factors of existing stations of moderate size (around 50,000 k.w. capacity) than by building huge stations having only slightly higher load factors than those of the smaller sizes.

FLORIDA LIGHTING AND POWER STATIONS.

Preliminary figures of the forthcoming quinquennial report on the central electric light and power stations of the State of Florida have been given out by the Bureau of the Census, Department of Commerce.

The statistics relate to the years ending December 31, 1917, 1912, and 1907, and cover both commercial and municipal plants. They do not, however, cover electric plants operated by factories, hotels, etc., which generate current for their own consumption, those operated by the Federal Government and State institutions, and those that were idle or in course of construction.

The figures presented for Florida show that the increases from 1907 to 1912 have continued during the later five-year period. There was a remarkable increase of 40 in the number of new establishments in the State since 1912, 28 commercial and 12 municipal, although, by reason of the combinations in single reports of a number of plants that reported separately in 1912, there was a net gain of only 32 in number of stations from 1912 to 1917. The total income in 1917 was $2,376,908, almost wholly for electric service, representing a gain of 74.6 per cent since 1912, while the total expenses were $1,684,569, an increase of 60 per cent. The corresponding increases from 1907 to 1912 were 108.1 and 119 per cent, respectively. In 1917 the total horsepower, of which 86.7 per cent was steam, was 58,195, a gain of 72 per cent since 1912. During the same period the kilowatt capacity of the dynamos increased from 23,619 to 37,812, or 60.1 per cent. The output of stations in 1917 was 50,887,992 kilowatt hours, compared with 25,895,751 in 1912, and the relative gains for the two five-year periods were 96.5 per cent and 120.1 per cent, respectively. From 1912 to 1917 there was a slight increase (3 per cent) in the number of arc street lamps, compared with 165.6 per cent for the incandescent and other varieties.

WATER WORKS OPERATION: MAKING WATER ANALYSES*

Information Concerning Nearly One Hundred Water Works Laboratories—Locating Laboratory—Taking Samples.

In October, 1917, J. J. Hinman read a paper before the American Waterworks Association in which he gave the result of an investigation of waterworks laboratories made by him. The investigation was confined to cities of more than 25,000 population, and replies were received from 91 such cities in the United States. Seventy of the plants in these cities were municipal and 21 were private water companies. Thirty-four of them reported an average daily consumption of 5,000,000 gallons or less, the others being larger than this. Nine of the cities obtained their water supply from wells or other underground sources, the remainder from rivers, lakes or surface supplies. Twenty-five did not filter the water, but most of these used chlorine, the total number using chlorine being 70. Most of the laboratories were one-man plants, although in the total 91 plants there were nearly 200 workers classified as chemists, bacteriologists and helpers. Five of the plants had two chemists and five had three each. One plant had two bacteriologists and one had three; twenty plants had one helper, five had two helpers, one had three and one had four. In most cases the chief of the laboratory had the title of chemist or superintendent of filtration. A number of those in charge were engineers who had picked up the rudiments of water examination sufficiently to enable them to carry on routine determinations. The oldest plants were those of New York and Utica, established in 1897. By 1905 the number had increased to ten, and additional ones have been installed each year since then. In addition to the cities reporting special waterworks laboratories, twelve purification plants have daily examinations made at private laboratories or at laboratories in adjacent cities. Thirty-two of these 91 report making plankton examinations, a considerable percentage of the remainder not storing their supplies in reservoirs and therefore having no occasion for such examinations.

* Continued from page 132.

Among the items of interest learned by Mr. Hinman concerning these several plants is the fact that 45 of the cities measured the water supply by Venturi meters, 6 by pitometers and 15 by revolution counters; 26 making no statement as to how the measurement was made, the presumption being that there was no regular method. While measuring water is not directly to be classed as a form of analysis or a laboratory function, such measurement is desirable and even essential where the water is treated with chemicals in order that the amount of chemicals used may be properly proportioned to the amount of water being treated.

A waterworks laboratory should be located close to the point where the samples are taken in routine practice, since many determinations are affected by time, the jarring due to traveling, temperature, etc. Such laboratory need not occupy very much space, but should be well lighted. Ventilation should be provided, and it should be possible to keep the room at a uniform temperature. The walls and ceiling should be plastered or tiled or covered with some other smooth, hard surface that will not collect dust and that does not contain cracks or seams where dust may collect and occasionally be jarred out into the air of the room. Running water, both hot and cold, should be provided. The floor and walls of the room should be solid and so located with reference to machinery or any other distributing factor that there will be no jarring or trembling which would affect the use of delicate balances and other appliances. While larger space is desirable, excellent work has been done in laboratories only five or six feet wide and eight to twelve feet long, with a door in one end and the working table along one side. Double these dimensions will ordinarily be sufficient for any laboratory connected with a small plant and used for water analyses only. Where tests of cement or other solids are to be made, all of the apparatus should be in another room, both because of the space occupied and also to prevent the dissemination of cement and other foreign matters in the air of the laboratory.

Where there are analyses to be made on samples taken from a number of points, such as several reservoirs scattered over a considerable area, it would be convenient to have a laboratory equipment carried in a special body mounted on an automobile chassis, so that the tests can be made, or at least the bacteriological tests begun, as soon as and at the spot where the sample was taken. Such a traveling laboratory, but one more elaborate than would be necessary for most water companies, was used by the New Jersey State Health Department in 1918 and was described in Municipal Journal for May 24th of that year.

Where samples of water are sent out of town for testing, it is desirable to have special containers for shipping them by express. One of the best of these contains a cradle slung in gimbals, which in turn are contained in a stout wooden box reinforced with metal straps; this making it impossible to tip the bottle appreciably from the vertical no matter what position the box should be placed in. The cradle itself is so provided with springs, felt, etc., that even the shock of dropping the box is to a large extent absorbed before reaching the bottle.

Before taking the sample, the bottle should be sterilized, and should be filled and emptied once or twice with the water being sampled before the final sample is taken. The stopper also should be sterilized and rinsed in the water and should be placed in the bottle while both are under the surface of the water or while the water is flowing over them, if this is practicable.

For taking samples at different depths, as in a reservoir, a number of devices have been used in different cities. The general scheme common to most is that of lowering the bottle to the depth where it is desired to take the sample with the cork or stopper in the bottle, then removing the stopper by means of a cord or other device, allowing the bottle to fill and then replacing the stopper and drawing the bottle to the surface. Since the bottle will weigh less than the water when being lowered, it will be necessary to attach a weight at the bottom of it; or the bottle may be fastened to a rod and thus lowered into the water.

DAYTONA SEWERS AND WATER WORKS.

In his report for the year 1918, the superintendent of the Water and Sewerage Department of Daytona, Fla., Geo. A. Main, informs the commissioners that its low water rates have not been increased because of higher costs of materials and labor; in spite of which the department furnished to other city departments "$3,015 more value in service than it has received from other departments, and has, besides, $3,500 more in cash and other assets than at the close of 1917."

Mr. Main recommends a practice in connection with the sewerage system which, while not novel, is by no means common. His recommendation is as follows:

"Daytona's municipal waterworks continues to provide the people with the pure, aerated, softened, artesian water for which Daytona has gained an enviable nation-wide reputation. The rates are low, the standard of service high, and the system of charging for the water service and incidental services in agreement with the systems in force in our leading cities. The municipal sewage disposal system sterilizes the sewage with chlorine gas at the central power plant and discharges the disinfected sewage, free from disease carrying properties, into the tidewaters of the Halifax.

"Our eight hundred and fifteen water customers and five hundred and fifty sewerage patrons are practically unanimous in their approval of the high standard of quality of these respective services and the up-to-date methods in the administration of the affairs of the departments.

"There is but one important change to be recommended, the wisdom of which seems obvious. At the present time the entire cost of operating the disposal system (except the small fund resulting from the $10.00 installation fees), is raised by taxation. Greater equity in the apportioning of the cost of operating and maintaining the disposal system could be and should be arrived at by a nominal charge against patrons making use thereof, the charge to be based on some rational scheme, as is done at Brockton, Mass., for example. Clearly, the principle underlying the disposal system service is the same as that embodied in furnishing water, gas, light, and similar service. The early establishment of such sewer service rates for our city is recommended."

NEW YORK SEWAGE SCREENING PLANT.

Since publishing, on February 15th, the description of the Dyckman street, New York, sewage screening plant, we learn that the plant began about that time to operate 16 hours a day, the operating force consisting of two men, each working an eight-hour shift.

Also we are informed that, although 4h.p. motors were originally specified for the plant, 2h.p. motors were actually installed and, on official test, proved ample to meet all operating conditions. Under normal conditions the actual current consumed for operating the screens is 0.7 kilowatts.

Municipal Journal

Published weekly at
243 West 39th Street, New York, N. Y.
by
Municipal Journal and Engineer, Inc.

S. W. HUME, *President*
J. T. MORRIS, *Treasurer* A. PRESCOTT FOLWELL, *Secretary*

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago

Contributed Articles and Reports

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

ELECTRIC AND STEAM PUMPING PLANTS.

Actual figures of cost of operating steam and electric pumping plants, for the same water works service and under presumably the same conditions (except for an increase in amount pumped of less than five per cent), as given in the article in this issue describing the Lancaster plant, show a great advantage in the electric plant, and demonstrate the wisdom of the change. Undoubtedly many other water works plants could effect a greater or less saving in operating costs by a similar change.

This does not follow as a matter of course, however. The relative cost of coal and of current in the place in question will be a most important factor in the comparison. Others to be carefully considered are the making of a proper allowance for interest on the cost of the new plant, the scrap or sale value of the steam plant (if it is not retained for stand-by purposes), and the annual depreciation allowance and upkeep cost of the electric as compared with the steam plant. The load factor, also, may play an important part. If the pumps can operate continuously at a uniform rate, discharging directly into a large reservoir, the cost per million gallons pumped by steam would be less than under conditions like those at Lancaster, where most of the consumption is served by a standpipe whose capacity is about one-twentieth of the daily consumption, and the rate of pumping must vary to a certain extent with that of the consumption.

Also, there are other considerations than those of cost. The National Board of Fire Underwriters considers that an electrically operated pumping plant, deriving its power from a distant plant through wires that may be broken, struck by lightning or otherwise damaged, is less reliable than a plant whose power is generated in the same building. And if less reliable for fire protection, it is also less reliable for other purposes for which the water is used. Interruption might also be caused by a strike, coal shortage, or (in the case of a hydro-electric plant) floods, droughts, ice, etc., which might have been avoided had the power been generated by a municipal steam plant.

It is by no means our object to belittle the advantages of electric plants for water works pumping. Under many conditions they are unquestionable. But we wish to warn against the conclusion that therefore a change from steam to electricity is advisable for every plant. The relative advantages and disadvantages for any given plant can be known only by making a careful study of all the conditions affecting the problem, and no change involving such a large expense should be decided upon until such study has been made by a competent expert.

POWER FOR MUNICIPAL LIGHTING PLANTS.

A problem somewhat similar to the above is discussed in another article this week, this being the securing of maximum efficiency in electric light plants. The article in question records the conclusion, from the investigation of a large number of plants, that economy in coal consumption is secured more by a favorable load factor than by increasing output; and that beyond a certain point, increasing output has little effect on fuel economy.

To apply this, a municipal lighting plant can generally reduce the cost of generating current more effectively by increasing its commercial day-time service than by any amount of extension of lighting service. If it is not possible to obtain a fairly uniform load factor, then it may be cheaper to purchase the current from a power plant that has a diversified consumption of its output and therefore less excessive peak loads; and the fact that a municipal plant can, for this reason, purchase current more cheaply than it can produce it is no reflection on the efficiency of the plant operation, but only the result of a fixed law. When, as is generally the case, the private power plant both has a more favorable load factor and also is much larger than it is practicable or even desirable that the municipal plant should be, then no one conversant with such matters would expect the municipal plant to even approach the larger power plant in efficiency.

The above refers to cost of operating steam plants only, and not necessarily to hydro-electric plants. Moreover, there may be advantages in municipal generation of power (such as those suggested in the discussion above of electric and steam pumping plants) that more than offset those of lower cost of current delivered at the switchboard. But the article in question furnishes an answer that should be convincing to those who would claim that failure of municipal ownership is demonstrated by the abandoning of a municipal power plant because it is cheaper to purchase current from a private central plant. Good business judgment would lead to the same change in the case of a privately operated lighting plant under the same general conditions.

LABOR AVAILABLE FOR ROAD WORK.

One of the most complete and important of the committee reports at the convention this week of the American Road Builders' Association was that by Paul D. Sargent, chairman of the Committee on "Sources of Supply of Unskilled Labor for Highway Work." Mr. Sargent sought information from state highway departments, engineers of the larger cities and road building contractors throughout the country. (We expect to publish this paper next week.) His conclusion from the opinions and facts submitted by these various parties is that "there will be a sufficient supply of unskilled labor for highway projects during the coming season, and at wages slightly less than those prevailing during the season of 1918."

This opinion takes into consideration pending legislation, including the proposed bill for preventing immigration. It would seem to indicate, therefore, that there is no need for any city, county or state to curtail any proposed paving program because of fear that labor

will be unobtainable. As to wage rates, these are expected to be less than last year, the average of all estimates being that the decrease will be about 10 per cent. But even so, they are expected to be on the average 75 per cent greater than in 1914.

The idea that labor will be sufficient for any amount of public works likely to be undertaken is apparently entertained also by the U. S. Department of Labor, which is conducting a vigorous campaign for the immediate inauguration of public works of all kinds, its object being to minimize unemployment of labor this year. There seems to be little question that 1920 will see abundance of work under way. The need is for work *now*, and all are urged to begin as soon as possible any public work that is contemplated.

PAVING STATISTICS OF CITIES.*

The following figures show the total amounts of the different kinds of paving needed and proposed in a number of cities in each of the different sections of the country. See the previous issue for the other sections and explanations.

South Atlantic States.

Sheet asphalt construction, 35,000; resurfacing, 94,000, 94,000; repairing, 2,000.

Brick construction, 36,000; resurfacing, 15,000.

Stone block construction, 10,000, 10,000.

Wood block construction, 20,000, 20,000; repairs, 20,000, 20,000.

Bituminous concrete construction, 66,000, 25,100; repairs, 9,000, 300.

Bituminous macadam construction, 28,000; resurfacing, 4,000; repairs, 13,000.

Waterbound macadam construction, 2,800, 700; repairs, 1,200, 1,200.

Gravel construction, 10,000.

Concrete construction, 32,500, 18,000.

Miscellaneous pavements, 51,000, 48,000.

Gulf States: Alabama, Mississippi, Louisiana and Texas.

Sheet asphalt construction, 9,600, 9,600; resurfacing, 35,000; repairs, 1,500.

Brick construction, 2,725, 2,725; resurfacing, 14,500, 14,500.

Stone block resurfacing, 10,500.

Wood block construction, 3,000, 3,000; repairs, 12,000, 12,000.

Bituminous concrete, 6,000, 6,000.

Bitulithic construction, 259,800, 89,700; resurfacing, 64,500, 64,500; repairs, 3,600, 3,600.

Bituminous macadam repairs, 1,000.

Gravel construction, 175,000, 165,000.

Concrete construction, 194,700, 39,700; repairs, 10,000.

Central States: Ohio, Indiana, Illinois, Kentucky, Tennessee, Arkansas, Missouri, Kansas and Oklahoma.

Sheet asphalt construction, 652,300, 386,150; resurfacing, 227,200, 185,600; repairs, 43,700, 43,150.

Brick construction, 1,637,100, 635,116; resurfacing, 183,200, 119,500; repairs, 43,000, 13,500.

Stone block construction, 119,900, 75,600.

Wood block construction, 121,300, 67,700; repairs, 5,000, 4,600.

Bituminous concrete construction, 356,400, 197,333; resurfacing, 155,000, 85,000; repairs, 79,200, 5,200.

Bitulithic construction, 148,000, 60,000; resurfacing, 25,000; repairs, 10,000.

Bituminous macadam construction, 108,100, 101,800; resurfacing, 67,500, 17,000; repairs, 164,500, 160,000.

Waterbound macadam, 328,500, 265,500; resurfacing, 335,400, 70,000; repairs, 99,200, 64,840.

Gravel construction, 615,500, 115,500; resurfacing, 15,000, 15,000; repairs, 197,200, 128,120.

Concrete construction, 820,100, 511, 750; resurfacing, 24,500, 24,500; repairs, 2,500, 2,000.

Miscellaneous pavements, 148,500.

North Central States: North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Wisconsin and Michigan.

Sheet asphalt construction, 530,700, 313,700; resurfacing, 139,000, 60,000; repairs, 61,700, 44,000.

Brick construction, 238,000, 85,000; resurfacing, 24,700, 3,000; repairs, 3,100.

Stone block construction, 8,100, 8,100.

Wood block construction, 76,600, 28,500; repairs, 3,100, 3,000.

Bituminous concrete construction, 175,000, 63,000; resurfacing, 90,000, 60,000.

Bitulithic construction, 59,000, 20,000; resurfacing, 23,000, 10,000.

Bituminous macadam construction, 25,000, 5,000; resurfacing, 102,400, 82,800; repairs, 10,000.

Waterbound macadam construction, 82,000, 37,000; resurfacing, 47,000, 27,000; repairs, 10,000, 10,000.

Gravel construction, 335,000, 190,000; resurfacing, 243,400, 80,000.

Concrete construction, 454,700, 129,900; resurfacing, 121,000, 121,000.

Miscellaneous pavements, 100,000, 80,000.

Rocky Mountain States: Idaho, Montana, Wyoming, Nevada, Utah, Colorado, Arizona and New Mexico.

Sheet asphalt construction, 289,400, 218,854.

Wood block resurfacing, 5,000, 5,000.

Bituminous concrete construction, 156,100, 95,000.

Bitulithic construction, 352,500.

Gravel construction, 10,000.

Concrete construction, 221,500, 135,000.

Miscellaneous pavements, 25,000.

Pacific States: Washington, Oregon and California.

Sheet asphalt construction, 205,500, 38,830; repairs, 20,200, 5,200.

Brick construction, 214,500, 79,000; resurfacing, 5,000; repairs 300, 300.

Stone block resurfacing, 500.

Wood block construction, 12,860, 12,860; resurfacing, 200.

Bituminous concrete construction, 48,500, 26,000; repairs 900, 700.

Bitulithic construction, 198,400, 112,620; repairs, 1,000, 500.

Bituminous macadam construction, 136,000, 53,000; reconstruction, 27,000, 15,000; repairs, 15,000.

Waterbound macadam construction, 260,000, 181,000; resurfacing, 68,000, 11,000; repairs, 11,000.

Gravel construction, 60,000, 60,000.

Concrete construction, 507,000, 273,900.

Totaling for the entire country (this total, of course, representing only the three hundred cities that have reported to us to date), we obtain the following figures. They should not be accepted as either the total amounts for the United States, or as necessarily proporional to such totals; but as showing the conditions in this number of cities scattered over the entire country. The figures given are for construction and resurfacing combined:

Sheet asphalt needed, 3,351,400; proposed, 2,211,900.

Brick—needed, 3,078,700; proposed, 1,267,200.

Concrete—needed, 2,798,700; proposed, 1,510,700

Gravel—needed, 1,674,500; proposed, 782,100.

Bituminous concrete—needed, 1,444,600; proposed, 775,400.

Bituminous macadam—needed, 1,339,900; proposed 1,110,500.

Waterbound macadam—needed, 1,275,700; proposed, 674,200.

Bitulithic—needed, 1,102,800; proposed, 387,600.

Stone block—needed, 552,500; proposed, 456,800.

Wood block—needed, 308,300; proposed, 193,100.

*Concluded from page 149.

The WEEK'S NEWS

Year's Highway Work in Virginia—Plan to Change Rhode Island's Highway Legislation—Wisconsin Joins U. S. in Venereal Disease Campaign—Reducing Typhoid Toll in California—Successful Municipal Electric Plant in Chicopee, Mass.—Minnesota Forest Fire Victims Aided by State—Propose to Annex Suburbs to Los Angeles—Taxing Railroads in New Jersey—Lower Fares in Buffalo—Higher Fares Refused in Des Moines.

ROADS AND PAVEMENTS

Highway Construction in Virginia.

Richmond, Va.—During the past year, according to the new annual report of G. P. Coleman, state highway commissioner, the state built 294 miles of road, at a cost of $1,038,873.62. This includes small bridges and masonry, with convict labor at $1.12½ a day, but without engineering expenses. The work was divided among 235 different places in 71 counties. Included in the expense is the grading ahead of resurfaced sections over 45 miles. In addition, resurfacing and construction work at a cost of $108,094.29 was done on 50 miles of road. Minor repairs cost $17,883.53. There have been constructed from the joint state and federal fund 13⅛ miles of surfaced road and 2.6 miles of graded road, at a cost of $86,734.18. All the counties in the state except three made application for state aid in 1918 in the form of convict labor or money. Thirty-three counties had convict camps operated in them; and about 900 convicts from the penitentiary and 300 from jails were employed. Joint state and county maintenance has been carried on at a cost of $673,434.30. The "state highway system" cost $11,193.68 for maintenance. Only a small part of this money was available for the past year. In addition to this, approximately 25 miles of road have been constructed with federal appropriations, on account of the damage done by army trucks and the need for military roads in the embarkation sections of the state. During the year 44 bridges were under construction. The cost was estimated at $162,954.42; 34 bridges were completed at a final cost of $135,224.42.

Changes Proposed in Rhode Island Highway Law.

Providence, R. I.—Changes in the highway laws of the state, which will give the state board of public roads the power to determine the width of roads and to acquire private lands for highway purposes, the regulation of motor trucks, and defining state highways, are urgently recommended by the board in its annual report presented to the legislature. The board further points out that never before have the conditions been so desirable for generous appropriations for road work as at the present time, and it asks for an appropriation of at least $400,000 this year in addition to the income from the automobile department for highway construction. The importance of the appropriation being made early in the session is also emphasized. The report contains the first full year's operations of the automobile department under the calendar year form of registration and the increase of more than $39,000 in revenue under adverse conditions, the report states, is a remarkable showing and fully justifies this change in the law. The board reviews the many obstacles which it has had to overcome during the past year due to the war, increased commercial and federal restrictions in road building, and states that under the circumstances the results have been very satisfactory. The policy of the board the past year, the report states, has been to continue as rapidly as possible the work of reconstruction of the main trunk lines where the roadbeds were soft and bad for travel in preference to making roads smooth for high-speed traffic. A strenuous and successful endeavor was made to maintain the good roads, the neglect of which would have been a serious economic error, the report says. Innovations in the types of construction of roads were adopted during the past year, including cement concrete and bituminous concrete, and the board expects much improvement in this line of work. Attention is also called to the failure of the towns and cities to remove snow and ice from the highways, which the law requires them to do, and suggests that some remedy be afforded. No convict labor was used on the highways last year, the board states, but intimates that this is no reason that there will not be in the future. The Penal Commission did not offer any convict labor to the board the past year. The division of road expenditures in 1918 follows: Reconstruction, $397,132.38; repairs to waterbound macadam roads, $108,931,69; repairs to bituminous macadam roads, $24,163.02; oiling waterbound macadam roads, $26,249.04; drainage, widening, cutting brush, guard rails, miscellaneous, $40,667.42; engineering and office expense, $39,875.01; machinery, tools, equipment, $14,650.91; advertisments, $970.62; total, $652,640.09. This total expenditure for reconstruction includes an expenditure of $69,994.26 under the provisions of the Federal Aid Road act. The report of the automobile department shows that there were 1085 accidents during the year. Seventy-one of the accidents resulted in the death of 75 persons; 771 persons were injured in 647 accidents, and 367 accidents resulted in property damage only. There were 1522 court room convictions during the year, resulting in fines of $20,482, and 312 cases were appealed. A total of 39,596 licenses were granted during the year.

SEWERAGE AND SANITATION

$100,000 for Wisconsin Venereal Disease Fight.

Madison, Wis.—Fifty thousand dollars a year for two years to eradicate vice and its diseases is the aim of the Wisconsin health board. It has been assured of co-operation by federal health authorities and awaits sanction of the legislature to make its plans effective. Dr. Ira F. Thompson, acting assistant surgeon of the U. S. Public Health Service, awaits discharge from federal duties to direct the work against social diseases in Wisconsin. The government will give the state $25,000 if the legislature appropriates a similar amount. Present plans are only for one year but a similar campaign is intended the second year. Of the government fund, 10 per cent will be spent in administering the work, 50 per cent in treatment by means of free and pay clinics, buying of remedies and remuneration to physicians and nurses for administering the remedies, 20 per cent in repressive measures such as prosecutions and investigations, and 20 per cent in education measures such as free lectures and distribution of literature. Much of the state fund will go into administrative channels. Capt. E. R. Beckwith, U. S. A., is in Madison to assist in acquainting lawmakers and health administrators with the government's plans.

Typhoid Rate Reduction in California.

Sacramento, Cal.—Since 1915 the typhoid death rate in California has been reduced 50 per cent. and a loss to the state in vital capital, estimated at $1,400,000, has been avoided, according to the report of the sanitary engineering bureau included in the biennial report of the California State Board of Health. The report says: "The net

result of all the effort at typhoid control has been to reduce the typhoid death rate per hundred thousand in California from 13.6 in 1914, the year before the bureau was created, to 9.7 in 1915; 7.1 in 1916, 7.4 in 1917, and indications are that a rate of 6.8 will be accomplished in 1918. California is now near the lowest of the states in typhoid death rate and yet there is still a vital loss to the commonwealth by this disease costing over $1,050,000 a year, which can be reduced only by measures for improved water supplies, sewerage and sewage disposal, cleaner streams, cleaner milk, vaccination and the general correction of filth conditions. More than half the urban population of the state, or 1,200,000 persons, are supplied with water from sources equipped with disinfection works, the bureau reported, forty-five cities and towns having installed such works on recommendation of the state bureau. Now 700 water supplies and sewage systems and 300 swimming pools are under regulation of the bureau. "The bureau insists on far-sighted planning," said C. C. Gillespie, director. "One finds 'septic tanks,' representing hundreds of thousands of dollars, in wide use in California. Yet at the time they were built experienced sanitary engineers knew the septic tank by itself was only the preliminary stage in sewage treatment. Notwithstanding this there is scarcely a septic tank of hundreds in California that is designed to fit into a logical enlargement of the plan." The bureau reported progress in summer resort sanitation, regulation of oyster beds to prevent the taking of oysters from polluted waters and inspection of ice.

STREET LIGHTING AND POWER

Municipal Plant Does Well.

Chicopee, Mass.—The charge for electricity for street lights during the coming year will be reduced from 4¼ cents per kilowatt-hour to four cents, according to an announcement made in the annual report of the municipal light commission, filed with mayor D. J. Coakley. At this new rate the street lighting will cost the city about $17,500. This amount may be increased by a number of additional lights being installed. The cost of street lighting during the past year was $18,697.13. The past year, according to the report, was an exceptionally good one for the department and it is not anticipated that the coming year will be as good, as a falling off in the consumption of electricity for power and light is expected. The deficit of the commission has been reduced by $17,663.77 and the indebtedness had been retired by $13,250. The commission sold three turbo-generators and condensers, a motor-driven exciter, a steam-driven exciter, six switchboard panels and the connecting piping and wiring during the year for $42,500. This money has been placed at interest through the city treasurer. It is purposed to use it at the rate of $2,500 a year to pay off the fourth issue of bonds, amounting to $96,000 which were issued to buy, among other things, the equipment which was sold.

Commission Says City Has No Power to Fix Rates.

Alliance, O.—The state public utilities commission has announced its decision in the case of the Alliance Gas & Power Co. It values the property of the company at $621,077 as of May 1, 1918, and allows the company an earning of 8 per cent and depreciation of 5 per cent. The rates are fixed for a period of ten years at 12½ cents and 5 cents for the first two and one-half years and 10½ cents and 5 cents for the last seven and one-half years of the time. The commission declares that the city council had no right to fix power rates and advises it to reopen dealings with the company concerning a fair street-lighting contract. For a number of years the company had been serving residence customers at a rate of 12½ cents per kilowatt-hour for the first thirty hours' use of the maximum demand figured on a basis of 40 per cent of the connected load and 5 cents per kilowatt-hour for all additional energy. In 1916, the city council passed an ordinance fixing the price of energy at 6 cents per kilowatt-hour for the first thirty hours' use and 3 cents for all additional. The company attempted to compromise with the city on a rate of 9 cents for the first thirty hours' use and 5 cents for all additional, but was not successful.

FIRE AND POLICE

Fire Exit Law for Factories Upheld.

New York, N. Y.—The constitutionality of the so-called factory exit law passed by the state legislature after the fatal Triangle fire in 1911, under which every factory building over two stories high must be provided on each floor with at least two means of exit or escape from fire, remote from each other, and all interior staircases must be inclosed by fire-resisting partitions, has been upheld by the Appellate Division of the Supreme Court. The question was decided in a suit of the owners of the Cockroft building against the State Industrial Commission, because structural changes in the building ordered by the commission would mean a loss of $215,928 to the owners. The building is occupied almost solely by manufacturing jewelers, diamond setters, lapidaries, and opticians. The Appellate Division affirmed the ruling of the lower court on the opinion of Justice Gavegan, who tried the case. Justice Gavegan's decision set forth the circumstances under which the law was passed, and stated that the plaintiff had failed to convince him that the building was safe for manufacturing purposes. In considering the constitutionality of the law, Justice Gavegan ruled that it is necessary for the safety of workers in factory buildings, and that the orders involving the Cockroft building are necessary to carry out the spirit of the law.

Fire Service "Wrecking Truck" Valuable.

Boston, Mass.—The emergency wrecking truck of the fire department has rendered very efficient and valuable service since it was installed in fire headquarters about two years ago, according to supervisor of motor apparatus Charles E. Stewart. The machine is a specially built auto truck, equipped with a four-cylinder seventy-horsepower motor, and weighs approximately seven tons. It carries all kinds of wrecking equipment, including jacks, bars, shovels, chains, ropes, repair tools, oil and fifty gallons of gasoline to supply motor pumping engines at fires when needed. The machine can make a speed of from forty to forty-five miles an hour and is equipped with a power winch and derrick on the rear end, which is capable of lifting a weight of ten tons. The wrecker is in reality a traveling repair and machine shop and responds to all third alarms. Among the ordinary uses to which the wrecker can be put are towing in wrecked apparatus, delivering fuel and pulling down walls at fire ruins. It has also been frequently used to rescue horses that had fallen into holes or ditches. The machine has been called to service in several hundred accident cases, and now averages almost a dozen calls a week. The wrecker was designed by supervisor Stewart.

GOVERNMENT AND FINANCE

Commission Declares Los Angeles Annexation Economical.

Los Angeles, Cal.—Annexation to the city of Los Angeles would be an economy to many cities adjoining Los Angeles, the City and County Consolidation Commission has announced in a comparative statement on the tax rate of all municipalities in the county. Los Angeles has a lower tax rate than 20 out of the 37 cities of the county, the City and County Consolidation Commission finds. The joint city, county and state taxes of Los Angeles city are $3.01, which is also the average of the 37 cities compared. If those cities on the border of Los Angeles, which are seeking water, outfall sewers and other metropolitan service were to annex to Los Angeles, it would be possible for them to reduce taxes, as well as to obtain the desired conveniences, in the opinion of the commission. George H.

Dunlop, president of the city and county consolidation commission, who prepared the comparison of tax rates with the assistance of J. S. McQuiston, director of the efficiency commission, and G. Gordon Whitnall of the efficiency bureau has issued the following statement for the benefit of those cities that are considering annexation to Los Angeles:

The City and County Consolidation Commission has had a comparison made of all 1918-19 municipal tax rates in Los Angeles county.

The comparison is made on the combined city and county rates, both based on the uniform county valuation. Of the 37 cities in the county, 20 are shown to have a higher rate than Los Angeles.

Manhattan Beach, with $4.72, has the highest rate in the county. Los Angeles has exactly the average of all cities in the county, $3.01.

That annexation to Los Angeles would be an economy for most cities in the county is shown. Among the larger cities with a rate higher than Los Angeles are:

Santa Monica, $3.98; Redondo Beach, $3.66; Venice, $3.37; Long Beach, $3.36; Glendale, $3.23; South Pasadena, $3.04.

Pasadena shows a rate 6 cents less than Los Angeles, but its municipal rate is based on a valuation above the usual 50 per cent valuation prevailing elsewhere.

Railroads Win Step in Tax Readjustment.

Trenton, N. J.—Supreme court justice Swayze has allowed the Federal Railroad Administration a writ of certiorari to review the action of the State Board of Taxes and Assessment in denying the application of the various railroads of the state for the reduction of the average tax rate of the state. This rate was set at $2.37 per 100; one of the elements entering into the computation being the rate of $1.73 fixed by Jersey City for the month of December. Following the action of the higher court in setting aside the Jersey City rate the railroads asked for a readjustment of the average rate. The railroads of the state have just paid all their taxes which are not affected by this case—about $5,500,000.

TRAFFIC AND TRANSPORATION

Fares Lowered by Commission.

Buffalo, N. Y.—The state public service commission for the second district has ordered the receiver of the Buffalo & Lake Erie Traction Company, beginning on Feb. 6 to charge only 5 cents, with transfer, in the city of Buffalo on all cars where he is now charging 13 cents without a transfer. He must also reduce to 10 cents the fare between the city of Lackawanna and the city of Buffalo on such cars as he is now charging passengers 14 cents, and to restore the sale in the city of Lackawanna of strips of seven tickets for 25 cents which he discontinued in January last and charged 5 cents fare.

Higher Fare Plea Rejected.

Des Moines, Ia.—The application of the receivers for the Des Moines City Railway for a higher fare has been denied by Judge Martin J. Wade in the Federal Court. The decision is considered a victory for the city by the city's attorneys. The company will not appeal. The ruling states that if the company's earnings are not sufficient to meet the fixed charges provided for in the franchise and pay for the present service the service must be adjusted to the income. Immediately upon receipt of the ruling officials of the Des Moines City Railway announced that a general curtailment of service would go into effect. Owl cars are to be abandoned, lines now on a seven-minute service are to be reduced to ten-minute service and non-productive lines are to be further reduced as to service. There is to be no curtailment of rush-hour service according to the announcement. Judge Wade holds that the franchise is a contract and that the fares fixed therein are definite and binding and that they cannot be increased. In this connection Judge Wade rules that the terms of the franchise as regards service are as binding upon the people as upon the company. The court said in part:

The only question involved before the court is whether or not section 17 of the franchise, fixing the fares at six for a quarter, is to be construed with section 7, which provides for the payment from the fares of all costs of operation, including taxes and interest, at not to exceed 5 per cent on the company's indebtedness represented by bond, and not to exceed 6 per cent on the remainder of such indebtedness and the setting aside of a depreciation fund.

It is the contention of the receivers, and for the purpose of this hearing only the contention is assumed to be true, that the income from fares will not pay the cost of operation, taxes, interest and depreciation and continue the present service.

It is here apparent, of course, that if this contention is true, fares will have to be increased or service reduced.

The court cannot close its eyes to the fact that in controversies over franchises for street railway companies, the thing most important in the minds of the people is the rates of fares. Fares touch the people most directly and I have no doubt from all the evidence before the court that so far as the people of Des Moines are concerned they assumed that the fare was definitely and finally determined by this franchise.

Of course the people of Des Moines cannot have service which will not be paid for out of the fares. The receivers are claiming that the service demanded by the city of Des Moines cannot under present changed conditions be rendered from the present income. If this claim is true, of course, it is most unfortunate; and yet these parties have made a contract and the court cannot modify its provisions.

That the contract did not contemplate a change of fares is further emphasized by the omission from the contract of any method of fixing higher fares.

New conditions may render it absolutely impossible for the people to get under the contract, what they expect in the way of service, but the people are bound by the contract as well as the company, and when they get that service which can be paid for under the provisions of the contract, they must be content.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Validity of City Contract—Knowledge of Council.

(W.Va.) Where a city has power to contract by express contract, and a contract is not against public policy, nor statutory or charter provisions, as to the mode of execution, it is liable on an implied contract, where with the knowledge of the council it received benefits rendered at request of duly authorized agents, either in absence of any contract, or where the express contract is invalid for irregularities.—Cade v. City of Bellington, 96 S. E. 1053.

Street Assessments—Judicial Status of Council.

(Ind.App.) Action of common council in levying street improvement assessments is quasi judicial, but the council is not even an inferior court, and so cannot exercise judicial power, and its decision may be collaterally attacked by a property owner in an action to enjoin collection.—Buckingham v. Kerr, 120 N. E. 422.

(Ind.App.) Under Burns' Ann. St. 1914, section 8710 et seq., in determining portion of primary assessment on abutting property of cost of paving improvement which should be carried back to each adjoining tract, common council acts quasi judicially, but in levying other assessments it acts ministerially.—Buckingham v. Kerr, 120 N. E. 422.

Validity of Franchise for Water and Light Company.

(U.S.C.C.A.Tenn.) A contract by a city for the supplying of water and electric lights for public purposes for 30 years, and fixing prices therefor, made under express legislative authority, with a company to which it granted an exclusive franchise for a like term, held valid and enforceable, so far, at least, as it relates to the city's contract, in its proprietary capacity, for a public supply of water and light.—City of La Follette v. La Follette Water, Light & Telephone Co., 252 F. 762.

An ordinance contracting for water and electric lights for public purposes, and incidentally granting to the company furnishing the same an exclusive franchise therefor, which was within the franchise power of the city, and also granting an exclusive franchise to use the streets for supplying water and lights to the inhabitants, which was not within its powers, is divisible and valid at least as to the feature relating to the supplying of water and electric lights for public purposes.—Id.

NEWS OF THE SOCIETIES

March 12.—VERMONT SOCIETY OF ENGINEERS. Annual meeting, Burlington, Vt. Secretary, Geo. A. Reed.

March 25, 26.—AMERICAN WATER WORKS ASSOCIATION, ILLINOIS SECTION. Eleventh annual meeting, Urbana, Ill. Secretary, G. C. Habermeyer, acting chief, State Water Survey, Urbana.

April 14-19.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Mineral Wells, Tex. Secretary, F. A. Rountree, Birmingham, Ala.

April 25-26.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, Logan Hall, West Philadelphia, Pa.

Nov. 12-14, 1919.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

Town-Planning Institute of Canada.

At the recent annual meeting of the Association of Dominion Land Surveyors, at Ottawa, the formation of a Town-Planning Institute was announced.

The idea was first formulated at the last annual meeting of the association, when a committee was appointed to form such an institute. The members of the committee were J. D. Craig, W. H. Norrish, F. J. Wight and H. L. Seymour (chairman), all of whom are also members of the topographical surveys committee of the association.

The committee decided that the most pressing phase of town-planning work is lack of education in the movement, so a meeting was arranged with Thomas Adams and Noulan Cauchon and with the three members of the D. L. S. Board of Examiners, namely, Dr. E. Deville, Dr. O. Klotz and M. Tobey. The committee then decided that town-planning had assumed sufficient importance to warrant the formation of a town-planning institute.

Mr. Adams addressed the association, stating that the main object of the institute would be "the promotion of scientific and artistic town-planning both in town and country. The three professions that are primarily interested are architects, engineers and surveyors," said Adams. "The Town-Planning Institute will bring together the members of these three classes in one united group. To form an institute without a sufficient number of men presented a difficulty to those who have been considering the problem. It has been decided that the institute for the first year will consist of probationary members only, each of whom will undertake to prepare a special thesis or to pass an examination before a board before being qualified for full membership.

"A committee of ways and means, consisting of Dr. Deville, surveyor-general; R. H. Millson, president of the Ottawa Chapter of Architects; and myself, have been appointed to prepare a draft prospectus and to submit a list of prospective members to an early meeting. Local branches will be formed in the larger cities, one in Ottawa having already been formed.

"It is desirous to have legal and non-professional members, so the institute will be divided into three groups—

"First, members and associate members (architects, engineers and surveyors); second, legal members; and third, honorary members and associates (non-professional class).

"I believe that the time will come in Canada when our public authorities will appoint engineers to study engineering problems, architects as members of committees for choosing sites, and surveyors will be considered fit to sit on land settlement boards."

In conclusion, Mr. Adams drew attention to the progress made by the British Institute, formed in 1909, and exhibited a series of slides.

New Jersey State County Engineers' Association.

The New Jersey State County Engineers' Association meeting was held at the Engineers' Club, at Trenton, on January 21. The association approved of state aid specifications to be recommended to the state highway commission. These specifications were the result of a year's study and research by members of the association. The report of the sign committee was received, approved and recommended to the state highway commission. The standard road signs and precautionary signs adopted by the association were the result of a year and one-half's work by the committee of the association.

The following officers were elected for the ensuing year: Garwood Ferguson, County Engineer of Passaic County, president; Thomas J. Wasser, County Engineer of Hudson County, vice-president; Alex H. Nelson, County Engineer of Atlantic County, secretary; Alvin B. Fox, County Engineer of Middlesex County, treasurer.

The banquet of the association was held at the Hotel Miller, with William Dill, state commissioner of motor vehicles; W. G. Thompson, state highway engineer; Robert E. Meeker, former state highway engineer, and executive engineers of the association as guests. Commissioner Dill praised the work of the county engineers' association in aiding him in preparing the present motor-truck license regulations. Mr. Thompson spoke of the co-operation between the county engineers and the highway commission on the state highway system.

PERSONALS

Alvord, John W., of the firm of Alvord & Burdick, Chicago, has resigned his position as chief engineer and member of the board of directors of the United States Housing Corporation of the Department of Labor at Washington, and will return to his engineering practice in Chicago. Mr. Alvord has devoted nearly a year of service in organizing the Engineering Division of the Housing Corporation and serving on its board of directors for war emergency work.

Artingstall, William, has resigned his position as project engineer of the United States Housing Corporation, and has resumed the practice as designer and consulting civil engineer, specializing in water supply, sewerage and sewage disposal. His office is in the Old Colony Building, Chicago, Ill.

Berolzheimer, Philip, has been appointed city chamberlain of New York City, succeeding Alfred J. Johnson. Mr. Berolzheimer has served as commissioner of parks for Manhattan and the Bronx and as president of the park board, and is succeeded in these positions by Francis Dawson Gallatin.

Brown, Charles Carroll, has been appointed assistant maintenance engineer in the division of highways, Department of Public Works and Building, state of Illinois. He succeeds Frank T. Sheets, who becomes bridge engineer. Mr. Brown is secretary of the American Society for Municipal Improvements.

Hayes, H. P., has been reappointed county engineer of Tarrant county, Fort Worth, Tex., for a term of two years.

Hopson, William A., Paterson, N. J., has been appointed to the Passaic Valley Sewerage commission to succeed James A. Blauvelt.

Lennon, James T., former mayor of Yonkers, N. Y., died Feb. 6, within an hour after being run over by an automobile. Mr. Lennon was 49 years old and a well-known political leader in the county. He had served four successive terms as mayor of his city, from 1910 until Dec. 31, 1918. Previous to that he was receiver of taxes and then controller.

Monroe, John H., is new fire chief of Savannah, Ga.

Rice, William Gorham, has been reappointed civil service commissioner of New York State for a term of six years.

Sauer, Fred J., assistant engineer in the office of Metcalf & Eddy, consulting engineers, Boston, Mass., died Jan. 30. He had been connected with Metcalf & Eddy for about 1½ years.

Williams, F. M., who served for several terms as mayor of Iowa City, Ia., died recently.

Wingfield, Nisbet, has severed his connection as city engineer and commissioner of public works of Augusta, Ga., and has opened an office as consulting engineer in that city.

Municipal Journal

Volume XLVI NEW YORK, MARCH 8, 1919 No. 10

A STUDY OF STREET FLUSHING

Result of Investigation of Rochester Methods by Bureau of Municipal Research—Machine Flushing and Hose Flushing by Contract and by City—Recommendations Concerning Procedure—Sprinkling Methods.

CORRECT WAY OF HOLDING HOSE IN FLUSHING PAVEMENTS.

This is the fourth and last installment of an abstract of a report on street cleaning prepared by the Bureau of Municipal Research of Rochester, N. Y., at the request of the commissioner of public works. The report was made by John T. Child, assistant engineer, under the supervision of James W. Routh, chief engineer of the bureau.

The first installment, in the January 18th issue, dealt with the organization of the force and the keeping of records, with a description of the stables and shop. In the issues of February 8th and 15th were discussed the methods believed most effective for sweeping by hand and by machinery, and the appliances used. In this issue the exact adjustment of flushing nozzles, the water pressure, filling tanks, flushing procedure, hose flushing, and sprinkling of streets are discussed.

DRAGGING HOSE OVER PAVEMENTS WEARS IT OUT.

Water is the best means of removing the fine dirt and dust particles on street pavements which cannot be removed by other means. In its use, however, there appears to be an unfortunate lack of differentiation in the public mind between street sprinkling and flushing. Sprinkling is merely a method of laying dust. In local practice, street sprinkling is done by means of tank wagons from which the water is spread through perforated nozzles by the force of gravity alone. It lays the dust for a short time, but does not wash the street or remove the dirt. On the other hand, the more recent practice of flushing, which is rapidly supplanting sprinkling, is done under a nozzle pressure of from 30 to 70 pounds, by hose or through fan-shaped nozzles on wagon or motor flushers. This method of distribution spreads and directs the water so as to wash the pavement and force dust to the gutters.

So-called flushing done by sprinkling carts is of little value and is more expensive than real flushing performed with a pressure of more than 30 pounds. The work done by 37 such wagons in Rochester in 1917 cost $10,732. The same amount of area could be covered much more satisfactorily by use of four motor flushers at a total cost of $8,200; this including 5 per cent interest and 20 per cent depreciation on a purchase cost of $5,000 each, and labor, fuel and oil. The cost per 1,000 square yards flushed by wagons in 1917 was 26.4 cents, but only averaged 9.6 cents by motor flushers.

Motor flushing is a very satisfactory method of street cleaning, particularly as a finishing touch in removing fine dust particles from the pavements. The very best flushing results can be obtained only where a street has been sprinkled a short time before. The reason for this is that it takes a little time for the dirt to become thoroughly wet and loosened so that it can readily be washed to the gutter. On this account a light rain just before or during the flushing aids in obtaining real cleanliness and should be taken advantage of to save sprinkling. In some cities sprinkling is done regularly in preparation for motor flushing, and this is especially beneficial on block pavements.

In some cities only one man is used per machine. In Rochester, however, it has proved more satisfactory to use a driver and an assistant. The latter makes the hydrant connections and operates the nozzle levers. As the tank prevents the driver from seeing behind when turning or backing the flusher, the assistant protects the apparatus from damage at such times by signaling with a red lantern while standing on the ground or on the side step of the flusher. This is a wise precaution, because the work is done at night, and although there are then comparatively few vehicles, they often are driven recklessly and at high speed.

The drivers' duties should be to drive the machines, to do minor repair work on the engine and pump, to keep a truck record, and to make out daily reports. The duties of the assistant operator should be to fill the tank, to operate the flushing levers and to guard the flusher from accident when turning or backing.

Two motor flushers were being used in Rochester, each with a direct connected centrifugal pump and four nozzles. No. 1 has a tank with capacity of 1,250 gallons and No. 2 of 1,500 gallons; No. 1 has an indicated horsepower of 30 and No. 2 of 40; No. 1 has a speed of 6 to 10 miles and No. 2 of 10 to 15 miles. It takes No. 1 5 minutes to connect to the hydrant, fill the tanks and get away, and No. 2 7½ minutes; and each empties its tank through two nozzles in 3½ minutes. No. 1 uses 7 gallons of gasoline and 1 pint of oil per shift, and No. 2 9 gallons of gasoline and 1 pint of oil. The working pressures on level ground are: Using two nozzles, 18 to 30 pounds, and 30 to 42 pounds respec-

tively; using three nozzles, 18 to 23 pounds, and 26 to 42 pounds; using four nozzles, 10 to 15 pounds, and 22 to 25 pounds. Flusher No. 2 produced very good results, but No. 1's work was not so satisfactory.

The pumps being directly connected to the main shafts, the speed and consequent pressure of the pump is dependent upon the speed of the car. Consequently the flushing is less effective when going up grade. It is therefore suggested that the tank be only partly full when going up grade, or that a less number of nozzles be used.

In flushing asphalt streets, these flushers used 299 gallons of water per 1,000 square yards, and 365 gallons in flushing stone block; and they covered 14,976 square yards per hour (average) of asphalt and 13,191 of stone block. The stone block, however, was not cleaned so thoroughly as the asphalt, because rougher. The stone block pavements were laid on sand with a sand filler, and the sand washed out of the joints and worked up from the foundation. The average cost of labor per mile was 70.53 cents, and the total cost including gasoline and oil, but not including water or overhead, was 90.39; this being per mile flushed, not per mile traveled.

From the study of these flushers the conclusions were drawn that 30 pounds is the minimum pressure that is effective, while 40 to 50 pounds is desirable; that 350 to 400 gallons of water should be used per thousand square yards; that because of the lower speed of No. 1, the operating cost was 28 cents per mile flushed higher than that with No. 2. It was found that, by changing the adjustment of the nozzles, more thorough cleaning could be done, the stroke from the rear nozzles being made to lap slightly over that of the fore nozzles. A strainer on the intake of the tanks was found desirable.

In general, it appears, as a result of tests made, that only two nozzles should be used together on either flusher. In order to save one trip, three nozzles may be used on a narrow street or for flushing the center of a very wide street, if an effective pressure can still be maintained. This qualification is important because it was found that where three nozzles were used together instead of two, less effective pressures, and consequently less side wash, were obtained. The result was that dirty spaces sometimes were left near the center of the street. When four nozzles were used together, water was wasted and, moreover, the nozzles were not all effective, because the two in front interfered with each other and pushed the water straight ahead instead of to one side. The resultant loss of pressure alone is sufficient cause to prohibit the use of four nozzles together at any time, with these machines. A suggested combination of nozzles for different conditions is indicated in the diagram. These diagrams are for motor flushers producing a maximum pumping pressure of 40 pounds. With a higher working pressure, which is desirable, a modification should be made in the diagram, as fewer trips would be necessary to produce the same results.

It was found that by reducing the width of nozzle opening and thus reducing the amount of discharge and so increasing the pressure and velocity of discharge, better results were obtained. Usually only two nozzles should be used at a time, flushing to the right; but sometimes the use of three, one flushing to the left, will permit flushing a narrow street in one trip, or will save a trip on a very wide street.

It is seen that a large part of the time is used in filling the tanks. This could be reduced by using 4-inch intake pipe and hose instead of 2½ inch, using the 4-inch nozzles on the fire hydrants.

Speedometers are not used on flushers on account of

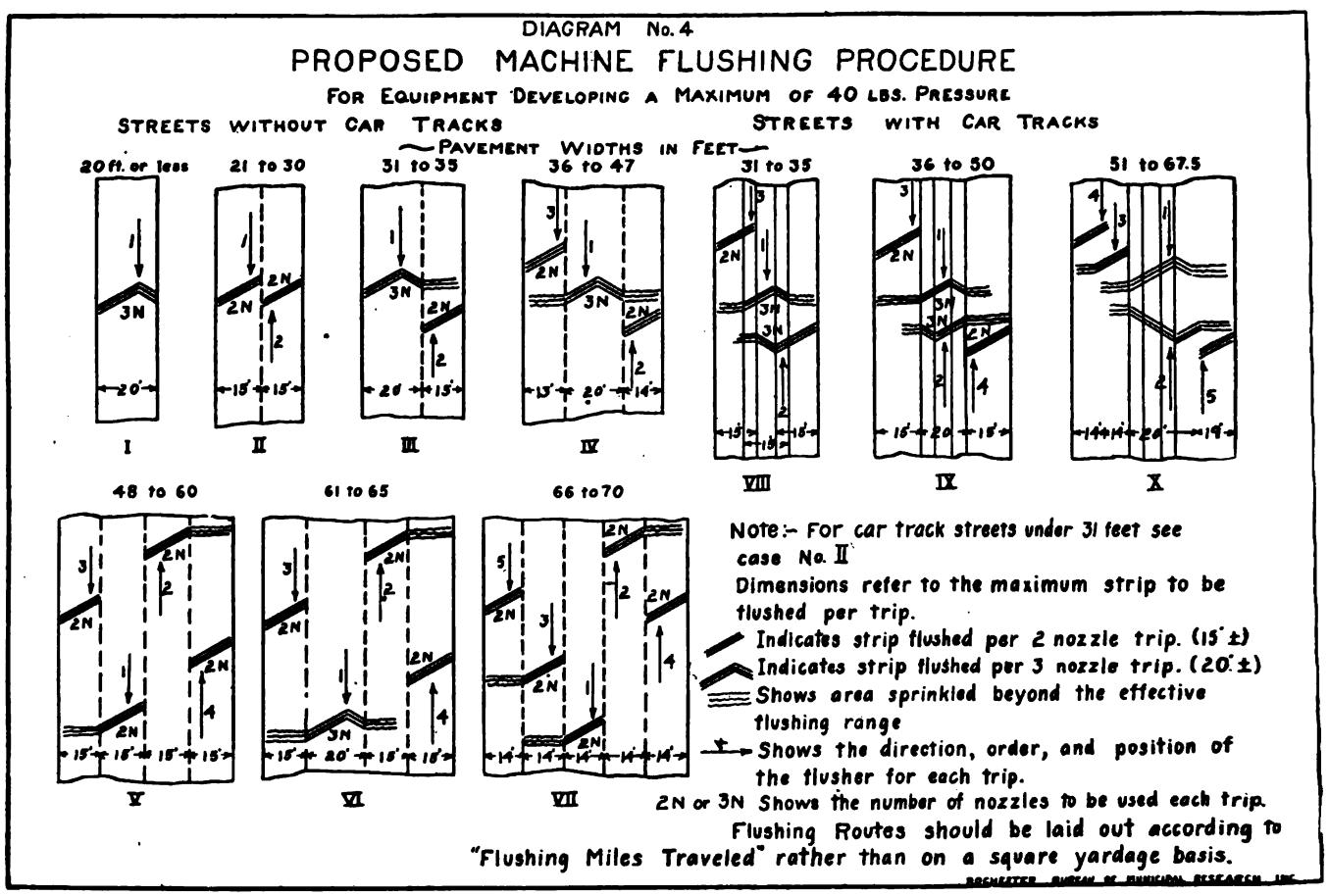


DIAGRAM No. 4
PROPOSED MACHINE FLUSHING PROCEDURE
FOR EQUIPMENT DEVELOPING A MAXIMUM OF 40 LBS. PRESSURE
STREETS WITHOUT CAR TRACKS
STREETS WITH CAR TRACKS
PAVEMENT WIDTHS IN FEET
20 ft. or less
21 to 30
31 to 35
36 to 47
31 to 35
36 to 50
51 to 67.5
48 to 60
61 to 65
66 to 70
I
II
III
IV
VIII
IX
X
V
VI
VII
Note:- For car track streets under 31 feet see case No. II
Dimensions refer to the maximum strip to be flushed per trip.
Indicates strip flushed per 2 nozzle trip. (15' ±)
Indicates strip flushed per 3 nozzle trip. (20' ±)
Shows area sprinkled beyond the effective flushing range
Shows the direction, order, and position of the flusher for each trip.
2N or 3N Shows the number of nozzles to be used each trip.
Flushing Routes should be laid out according to "Flushing Miles Traveled" rather than on a square yardage basis.

SUGGESTED COMBINATION OF NOZZLES FOR DIFFERENT CONDITIONS.

the vibration, but hub odometers will give satisfactory service and are recommended.

As so large a part of the time is spent in filling, it is recommended that the motor be stopped at such times, thus economizing in gasoline.

The life of hose could be prolonged if more care were exercised in turning on the hydrants slowly, and also if hanging the hose over one hook were discontinued. If possible, the hose should be hung around the tank of the flusher without kinks. (These points are largely matters of instruction and discipline which should be given constant attention.)

Sprinkling the street 15 to 30 minutes before flushing would increase the effectiveness of the results, especially in removing horse droppings, as it would soften up the dirt, which could then be washed off more readily.

It is believed that 1,500 gallons is the largest size tank that can be used on Rochester's streets without detriment to the pavements. Two flushers which could maintain the same speed could be used to advantage in a battery on the wide streets. If this were done, the less frequented streets could be flushed first and the others done in the early morning hours, when there would be no serious delays from vehicular traffic.

It cannot be expected that the best results will be obtained if the work is done without competent supervision in the field. The work done by each flusher should be studied and analyzed under the various conditions to be met, and the work should be planned so as to get the best results possible from each machine.

Burlap spray shields should be used on leaky hydrants and hose to protect pedestrians. Nozzles should be closed when the flusher is stopped by traffic or when horses are frightened. The horn should be blown when approaching vehicles, corners, or people standing near the curb or on the street. Hydrants should not be opened too rapidly, for this damages the hose; they should be closed after use. Damaged hydrants should be reported.

HOSE FLUSHING.

Motor flushing was very satisfactory on asphalt streets in Rochester, but not on stone block streets, especially where there were street car tracks. More trips by flushers would give better results, the flushing strokes lapping further. But the best results on rough pavements can be secured by hose flushing.

Flushing streets with hose is the most widely applicable manner of washing them. Hose can be used to advantage where other flushing apparatus can not. With hose the stream can be concentrated where needed and the quantity of water can be varied by using different sizes of nozzles.

Ordinarily a hose flushing gang should consist of two men, who should serve alternately as nozzle man and hydrant man. This would give both of them flushing practice and prevent either one from getting over tired. A gang of two men, alternating the work of directing and pulling the hose, under ordinary night conditions and with 30 pounds hydrant pressure, can flush clean, on an average, 25,000 square yards of pavement in eight hours. If more than 100 feet of hose are used, three men are necessary to handle it, and where litter is heavy, a man is required to pick up refuse ahead of the flushing work.

The real function of flushing is to wash fine dust from the streets; this cannot be removed by other ordinary means, such as sweeping. Furthermore, snow and slush, and even ice, can be flushed off the street with a 2½-inch hose. In such cases the work should be done under direct charge of a foreman, who should watch the weather conditions and stop the work before freezing begins.

On downtown streets, hose flushing should be done at night, when the traffic is comparatively light and the water pressure high, and when there is the least danger of accidents or complaints from splashing pedestrians or frightening horses.

Good practice indicates that the pavement should be sprinkled with the hose before being flushed, to soak up and loosen the dirt (this can be done by placing the forefinger in the stream to spread the flow); that the flusher should stand astride of the hose and direct the stream with both hands on the nozzle; that flushing should be done down grade whenever possible; that the effective flushing range from the nozzle is usually from six to forty feet, and that the nozzleman should stand near the middle of the street and flush from the center to both sides of the street. Litter should be picked up before and during flushing; if it is light, the flushing gang should do it, but if heavy, an extra man is needed.

It is not to be expected that a large force of hose flushers will be employed on such work all the time; but there are days in the late winter and spring when two men flushing can do more and better street cleaning than twenty men with shovels. Ice can be ripped up from the pavement with a good hose stream, slush and mud can be washed to the gutters in a short time, and the gutters can be opened at less expense than by picking and chiseling. It is believed that hose flushing should be taken up also as a regular summer cleaning practice.

Rough pavements require more water than smooth, and hence large nozzles should be used for cleaning them. Two-inch rubber hose is recommended; except that where the hydrant pressure exceeds 50 pounds 1½-inch hose may be used.

Three-quarter-inch nozzles should be used with 1½-inch and 2-inch hose on all pavements except Medina block or stone, where a 1-inch nozzle with 2-inch hose will give good results. (As stated above, more water, even at the expense of less pressure, is required to flush the rougher pavements.) Shut-off nozzles are too heavy to handle easily, and this, together with their high cost, does not justify their use for this work, except when flushing in traffic. About five pounds is the handiest weight for a flushing nozzle.

The following equipment should be furnished to each hose flushing gang of two men:

Equipment	Approx. Weight Pounds.	Approx. Price (1917).
One hose reel	233	$ 30.00
Three 50-ft. lengths of 2-inch hose at 75 cents	204	112.50
One ¾-inch plain nozzle	5	7.00
One 2½-inch to 2-inch reducer, hand swivel type	1	2.25
One hydrant key and spanner	2½	.15
Two inlet dams	25	
One spray shield	10	
	480½	$151.90

Three men are needed if three lengths of hose are used. Two inlet dams should be supplied to each gang to prevent litter and dirt from being washed down the sewers. These dams can be made by nailing worn-out fibre broom heads together, end to end, and wrapping them with burlap.

Hose should not be dragged on the ground, as this wears it out. It should be unreeled toward the hydrant in connecting up. The full length should be used before changing hydrants. The hose should be strung along

INLET DAM FOR HOLDING BACK DIRT.

the curb, thus lessening the interference with traffic and increasing the distance reached.

The chief factors involved in laying out flushing areas for two men doing hose flushing are (1) the class and amount of traffic, (2) the kind and width of the pavements and location of the hydrants, (3) the water pressure available.

Most of the flushing should be done at night (from 10 P. M. to 5 A. M.) in order to avoid traffic as much as possible. Any kind of traffic hinders the work, and the greater it is, the smaller is the area that can be covered. Motor traffic requires the hose to be deviated for short intervals, but makes little extra work. On the other hand, horse-drawn traffic is slower moving and hence is in the way longer. It is also the cause of more dirt which is difficult to remove.

SUGGESTED PROCEDURE FOR HOSE FLUSHING.

When the gang arrives at the place to begin work, the route should be looked over and the litter picked up. The nozzle end of the hose should be on top of the reel and, when 100 feet from the hydrant, the nozzle-man should take the nozzle end and hold it while the hydrant-man drags the reel toward the hydrant, unreeling the hose along the gutter as he goes. When he arrives at the hydrant he should place the reel on the sidewalk out of danger of being hit by traffic. He then should remove the hydrant cap and secure the hose tightly to the hydrant, making sure that a washer is in the coupling to prevent leakage. He should place the key on the hydrant and turn on the water gradually when the signal is given by the nozzle-man. While the hydrant-man is connecting up, the nozzle-man should see that the hose is free from kinks. Then he should take up a position in the center of the street at the full length of the hose from the hydrant and when ready (with nozzle valve open to allow air to escape, if the nozzle is shut-off type), he should signal the hydrant-man to turn on the water.

The hydrant-man should turn the key slowly in the direction indicated by the arrow on the hydrant. If the key does not turn fairly easily, it should not be forced; that hydrant should be abandoned and the fact reported to the superintendent when he appears. (Forcing a hydrant open may break the stem. Turning on water too suddenly may damage the water system or hose or throw the nozzle-man off his feet.) If hose or hydrants leak, a burlap spray shield should be thrown over the leak. When the water is turned on, the hydrant-man should help the nozzle-man by picking up a loop of hose and taking the weight of it from him when moving.

The nozzle-man should start work by spraying the pavement for a distance of about 100 feet from the nozzle. (Spraying can be done by holding the forefinger in the stream.) By turning in his original position, the nozzle-man should spray all the pavement within reach of the stream, unless the pavement is already wet from rain or sprinkling cart. This spraying softens hardened refuse that sticks to the pavement. As little water as possible should be used for this purpose.

After spraying from one position, flushing should be done in the same line that the spraying was done so as to give as long a time as possible for the dust to become soaked. Flushing should be done from the center of the street to the sides at distances varying from four to sixty feet from the nozzle. The stream should be swung back and forth and be raised so as to force the mud wave to the gutter. When one section is flushed, the next should be sprayed ahead as far as possible. Under usual conditions the stream will reach 100 feet or so, but effective flushing can be done only for about 60 feet. When nearly finished with one section, the nozzle-man should send the hydrant-man to the hydrant. When finished, a signal to shut off the water should be given.

The hydrant should be turned off slowly and the hose uncoupled. If the hydrant does not drain properly, something may be under the valve. In such a case the valve should be opened and shut several times, if necessary, to wash it out. If it still does not drain properly, the superintendent should be notified on his next round. The cap should then be replaced and the hose reeled up from the hydrant toward the nozzle, the reel dragged toward the next hydrant and the hose unreeled as before.

When flushing, the stream should be kept behind the dirt wave at all times and the dirt flushed to the gutter as fast as possible. Flushing should be done in the direction of the down grade and with the wind whenever possible. When using a shut-off nozzle, the water should be turned off when not in use or to avoid traffic. It should be turned off slowly.

When the work is finished, the hose should be drained before final reeling. This can be done best by two men raising the center first and then each man working toward one end. Equipment should be checked up before leaving the job.

Ordinarily flushing hose lasts from eight months to a year with daily use, depending on the care which is given it. Its life is lengthened if kinks are kept out of it, and if care is taken in reeling the hose and in turning on water to full pressure. The men should be instructed in the proper manner to care for hose, and supervision should be provided to prevent carelessness and failure to follow instructions.

The flushers should be taught to increase the life of the hose by mending breaks. A simple method of mending tears and leaks in flushing hose is by winding them with bicycle tape and then lacing on pieces of old hose to take the wear. Also an easy means of reducing the wear from dragging the hose is by wiring several rings of old garden hose at intervals on each 50-foot length. The old garden hose probably can be obtained from collected rubbish, and repairs can be made at the section headquarters by the janitors. These simple expedients not only prolong the life of hose and thus save money but do away with much inconvenience and time lost when new hose is not to be had when needed.

STREET SPRINKLING.

Street sprinkling is valuable in preventing dust from blowing about, especially on macadam; but not as a method of cleaning. It is also desirable in advance of flushing, as described above. It is seldom done intelligently, but is frequently omitted when and where most desirable and performed where unnecessary and ever detrimental.

In Rochester it was found (and would probably be

found in many other cities): (1) That continually keeping car tracks wet is detrimental to both the track paving and rail maintenance and therefore to car service; (2) that over two-thirds of the sprinkling is done on paved streets with no real cleaning results; (3) that no control is exercised over the work by officers of the street cleaning force; (4) that sprinkling when done should be in conjunction with street cleaning work; (5) that it rains an appreciable amount on more than 40 per cent of the days in the sprinkling season; and (6) that sprinkling on unpaved streets as now practiced is detrimental to the sewers and to macadam streets.

Performance tests were made of sprinkling with the motor flushers, the sprinkler nozzles being set at different angles. Some of the tests are shown in the accompanying illustrations. The best distribution was obtained when the nozzles were set with the top holes at the same level on both sides and the pressure between 15 and 20 pounds. When the nozzles spread more than 20 feet the distribution was poor and the quantity of water insufficient.

The best sprinkling results with flusher No. 1 were obtained when the pressure was 12 to 20 pounds, speed 6 miles per hour, width sprinkled not over 18 feet for one trip or 30 feet for two. With flusher No. 2 when the pressure was 15 to 20 pounds, speed 7 miles per hour,

BEST SETTING FOR ONE NOZZLE FOR SPRINKLING.
Sprinkles 15 to 20 ft. width.

and width sprinkled not over 24 feet for one trip or 42 feet for two.

SPRINKLING NOZZLES USED TOGETHER.
Most of the water is spread under the machine; the rest is poorly distributed and insufficient in quantity.

EXTREME SETTING OF BOTH NOZZLES.
Sprinkles 30 to 40 ft. strip; very poor distribution of water and alternate wet and dry spaces. Constant danger of wetting pedestrians. Most water concentrated under machine.

BREAKING UP CONCRETE PAVEMENT WITH DYNAMITE.

In the city of Warren, Pennsylvania, recently, contractors were tearing down an old suspension bridge built in 1873 to replace it with a modern concrete bridge. Stone abutments ten feet thick, fifty feet long and twelve feet high anchored the ends of the cables, and a concrete pavement, twelve inches thick, 8,700 square feet in area, formed the approach to the bridge.

Breaking up this masonry and concrete construction was a problem. The contractors hesitated to use dynamite because the bridge was in the heart of the city, houses were located within fifty feet and pedestrians and vehicles were passing continually. However, blasting was finally decided on, but instead of using large charges of dynamite to break up large sections of the material every shot, the blaster adopted what is known as a nibbling method; that is, bore holes were put down in the concrete or cement between the stones, which were loaded with small charges consisting of quarter-pound loads of forty per cent dynamite well tamped into each hole. Each charge broke out chunks six to eight feet long and of varying widths. Not the slightest damage was done to adjacent buildings. Not a window was broken. No pedestrian was even startled.

In this way, the work was done much more quickly than would have been possible had laborers with sledge hammers and drills been used, and labor cost was saved. Only thirty pounds of dynamite was necessary to complete the entire job.

BINGHAMTON SAND CATCHER.

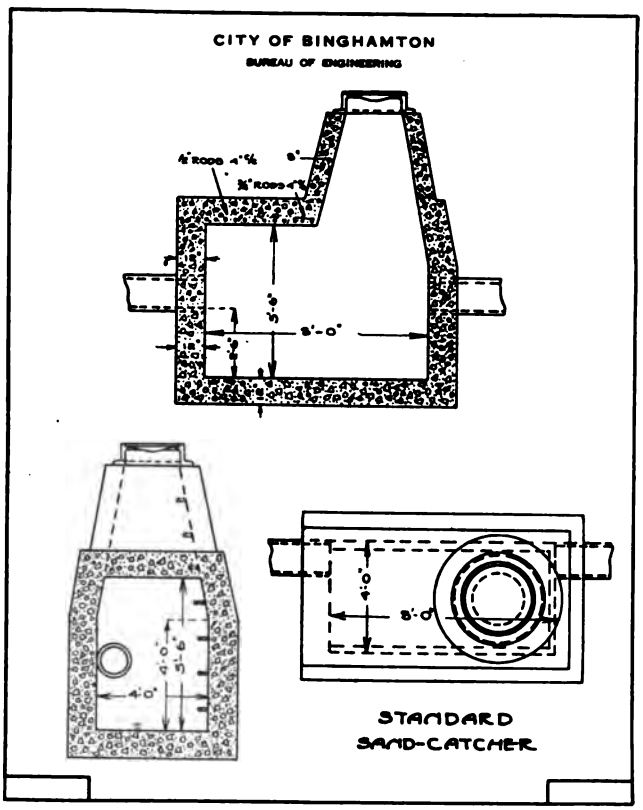
Tried Out Successfully for Preventing Deposits in Sewers with Flat Grade and Poorly Designed—Adopted as Standard.

By W. EARL WELLER.*

In all recent literature on the subject of sewer design the matter of sand catchers is discussed very briefly if at all. The tendency is towards details that will prevent the introduction of sand and grit into the sewers and towards the maintenance of self-cleansing velocities should these details prove inadequate. The soundness of these principles is beyond question, but occasionally the municipal engineer is confronted by an existing condition which calls for a remedy. If this condition happens to concern a sewer which is frequently choked by deposits of grit, the question of a sand catcher located at some strategic point in the sewer itself merits consideration.

*City engineer of Binghamton, N. Y.

One of the older sewers in Binghamton, dating from the days of aldermanic control, has, owing to poor design, been the cause of considerable expense. The sewer in question consists of an 18-inch vitrified tile section laid on a 3.07 per cent grade; a 22-inch section on an .8 per cent grade and a 15x22-inch egg-shaped section on a .2 per cent grade. The various sections discharge



BINGHAMTON'S STANDARD SAND CATCHER.

into each other in the order named. It will be noted that the capacities of the various parts of the line decrease as we approach the discharge end. Further complication is caused by a poorly designed junction with a larger egg-shaped sewer. The combination results in a choked sewer which in turn causes flooded cellars during even light rains.

As soon as possible after every severe storm it has been necessary for the department to detail a gang of five men from the Bureau of Sewers for the purpose of removing the deposit. In a period of six weeks during the season of 1918 this gang was twice called upon to clean the lower 700 feet of the sewer. The work was done with a sewer cleaning machine of the drag bucket type and required seven days on the first occasion and six days on the second at a total cost of $124.25 and $104.75 respectively. These figures make the actual cost, neglecting supervision and the rent of the machine, 18.6c and 15.7c respectively per linear foot of sewer cleaned. These two expenditures (which gave every promise of being repeated) and the complaints of disgruntled residents regarding sewage-flooded cellars caused the city officials to seek a more satisfactory arrangement and it was practically decided to replace the sewer with another that would not lightly disregard all the canons of sewer ethics.

Before adopting such a drastic remedy it was decided to try the efficacy of a grit chamber in the existing sewer. Consequently there was constructed in the 15-inch by 22-inch section, near its junction with the 22-inch section, a grit chamber 3 feet deep, 5 feet wide and 5 feet long. This chamber was built of brick on a concrete base 12 inches in thickness. The walls were 8 inches in thickness and were covered inside and outside with a thick plaster coat. Access to the chamber is had by means of a standard manhole opening. The chamber was constructed by employes of the department and cost approximately $60. It can easily be cleaned by two men in less than a day at a total cost, including disposal of the removed material, of about $7.50. It has been planned to clean the chamber after every heavy storm. It is apparent from the cost figures given above that, if the appliance is successful only in cutting the required number of cleanings in half, it will easily have earned about 50 per cent. on its investment after just one storm.

The results have been so satisfactory that at least one other sand catcher will be constructed in another troublesome sewer in the spring. In the new chamber the walls, or at least that portion of the walls below the level of the sewer invert, will probably be built of concrete. The length will be increased to 8 feet and the depth decreased to 2 feet. The design will be standardized and added to the sewer standards of the city. The department does not pride itself on a new discovery but believes that it may have hit on the reapplication of an almost-forgotten kink. It might be mentioned in closing that all storm water inlets in Binghamton are of the standard sand-catching basin type but the velocity of the entering water on some of the steep grade streets rather negatives their silt catching propensities, resulting in the previously mentioned deposits in the sewer proper.

SAN FRANCISCO SETTLING CHAMBER.

San Francisco has employed a type of settling chamber for intercepting heavy sediment that is carried by the sewage flowing in a large combined sewer. The chamber consists of an enlargement in the width of the sewer and a drop of two or three feet. A special feature is a central wall that divides the settling basin into two equal channels, the object of which is to facilitate removal of the deposited matter. During the dry season the material that has settled in the basin is removed, one side being cleaned at a time by placing at each end, between the division wall and one side wall, a dam of sand bags which diverts the dry-weather flow through the other side or channel; the dam being then moved to the other side of the central wall to permit cleaning that side of the basin. The material is taken up in buckets through a manhole. In the illustration a ladder at the manhole can be seen faintly in the distance. At the top in the foreground is seen a steel pipe crossing through the arch of the chamber.

SAN FRANCISCO SETTLING CHAMBER.

GUARANTEES FOR PAVEMENTS

Report of Committee of American Road Builders' Association at Its Recent Convention—Guarantee Period of "Reasonable Life Without Repairs."

In view of the looseness with which the terms "Guarantee" and "Maintenance" are often applied to paving contracts, your Committee, in discussing the subject assigned to it, wishes to make clear that it believes the two terms should be regarded as separate and distinct and that the guarantee period should not be longer than the reasonable life of the pavement without repairs, except those rendered necessary by reason of defective materials or workmanship or both.

This is in accord with numerous court decisions in connection with assessment work and automatically settles the question of legality and at the same time clearly indicates the maximum period which should be called for in a guarantee. Your committee recommends that this maximum period should be fixed at 5 years.

Three types of guarantees are in common use:

a. Bond—preferably from a surety company.

b. Retention by the municipality of a certain amount of cash.

c. Bond and retained percentage.

The intent of the guarantee is to guard against defects in material and workmanship and non-compliance with the specifications, but in many cases defects may develop in the pavement or roadway which are due to other causes and conditions which may have been entirely outside of the scope of the contract.

It is apparent, therefore, that the responsibility for a satisfactory and lasting pavement is shared by both the engineer and the contractor. With the engineer rests the responsibility for providing proper drainage and adequate foundation and the selection of a suitable type of pavement and the preparation of comprehensive plans and specifications. He must also provide such inspection as is necessary to insure strict compliance with the specifications.

With the contractor rests the responsibility of carrying out in a satisfactory and workmanlike manner the plans and specifications and instructions of the engineer.

The safeguarding of the public welfare lies, therefore, in the hands of the two parties above mentioned with the following possible exceptions:

In a number of instances pavements have failed due to causes which may or may not have been controllable by the engineer or the contractor:

Defective street railroad construction;
Settlement of trenches for underground service pipes;
Improper system of cleaning the pavements;
Leaky gas or water mains.

The engineer is directly responsible to his community and if he is negligent or incompetent he should, and presumably can, be removed. Generally speaking, the question of public welfare or economics in this connection is not directly involved in the guarantee clause of a contract except in those cases where an incompetent or negligent engineer has prepared faulty specifications and as a consequence thereof has asked a contractor to guarantee a pavement which is liable to fail through causes other than defective materials and workmanship.

Assuming that the plans and specifications are entirely competent and proper, the next duty devolving upon the engineer is that of inspection, which includes testing of the materials to be used. This requires a laboratory equipped for physical and chemical testing and the services of some one who has made a specialty of testing paving materials, as such work does not come within the scope of an ordinary chemist. Most states and a number of the larger cities maintain their own laboratories and testing staff. Smaller municipalities may and frequently do avail themselves of consulting and testing experts, but a certain proportion of them do not and, on the contrary, permit their pavements to be laid with only such supervision and inspection as their engineers can personally give to the work, and in many instances these engineers are not well qualified in this particular line and would gladly avail themselves of expert help were they permitted to do so.

In addition to the preliminary testing of materials, provision must be made for the inspection of the work as it progresses. Where the pavement is manufactured in a plant and then delivered to the street, inspection at both the plant and the street is essential. For example; in the case of a large asphalt plant where 200 to 300 batches of mixture are sent out daily involving 600 to 900 separate weighings, a rigid inspection, such as would justify the total elimination of a guarantee clause, would require two inspectors. The preparation of the subgrade, the mixing and laying of the concrete base, and the laying of the wearing surface would similarly require two or three inspectors and these must all be trained men, not haphazard appointees.

From the standpoint of a municipal engineer this is a very serious problem. His reputation, as judged by the lasting qualities of his pavements, might often rest in the hands of inspectors whose appointments and qualifications were entirely outside his control.

In the abstract, it has been justly said that with competent inspection, guarantees could and should be entirely eliminated, but from an economic standpoint there remains the question of cost of sufficiently adequate inspection and the difficulty of securing it.

The drawbacks and defects in the guarantee system are too well known to require elaborate discussion in this report, but it is a fact that present inspection systems have been devised and carried out with a view to providing reasonable (but not absolute) security, having in mind the certain or uncertain amount of additional protection accruing from the guarantee clause inserted in almost all paving contracts. If this is to be abolished the inspection must be made more rigid and therefore costly, and the lines must be drawn more tightly than heretofore both as to materials and workmanship.

Engineering is not an exact science insofar that in all cases a certain factor of safety must be employed, and there is no such thing as a hair-line division between good and bad. When the results are guaranteed, even though the guarantee is far from perfect, it is human to require a somewhat lower factor of safety than would otherwise be insisted on. Where the contractor assumes no responsibility for his finished work, the inducement to slight it and thereby save money is greatly increased and the inspecting force must be still more competent, vigilant and trustworthy than would otherwise be necessary.

The cost of a guarantee bond to the average contractor does not exceed 1 per cent of the total cost of the contract. On a pavement costing $3.00 per square yard this would amount to 3 cents per square yard, which would barely cover the increased cost of inspection above described without taking into consideration at all the increased bidding price likely to result from increased severity of inspection.

Assuming that the guarantee is only for the normal life of a pavement without repairs, there exists no legitimate reason for the contractor to increase his construction bid by more than the cost of his bond.

As between a reliable and established contractor and one who is lacking in experience, resources and equipment, it is easier and cheaper for the reliable contractor to secure his bond and this can only be regarded as a legitimate advantage to him. As a general rule, he will favor a guarantee bond.

Where contractors do not have an established plant or organization in the municipality or locality where the pavement is being laid, some guarantee for the repair of such defects as may develop would seem to be a necessity. In many smaller towns a single contractor may remain for two or three years and then withdraw after the available paving area has been completely improved. It may be years before any new paving is done and it is often very difficult to get the contractor to return and make any repairs during the guarantee period.

It is sometimes claimed by the contractor that where the specifications are closely drawn and compliance with them is insisted upon, he should be relieved of the responsibility of guaranteeing results. Your committee believes that after having examined the site of the improvement and studied the specifications he is or should be fully familiar with conditions; and if, after doing so, he signs the contract and guarantee, he has no reasonable ground for subsequently opposing the engineer in his desire to carry out the provisions of the specifications and that such insistence on the part of the engineer does not and should not relieve the contractor of his guarantee obligations.

If he believes the specifications are faulty, he is under no compulsion to bid on the work, and if he does so, he acts with his eyes open and has no one but himself to blame. The history of court decisions would appear to show that the contractor is at least as well protected as the city when the matter comes up for legal adjudication.

We also recognize that certain large cities may have within their confines three or four large paving plants and that conditions are such that it may be difficult for an outsider to break in. In such cases it is possible to imagine an arrangement between bidders whereby the city would pay excessively for their guarantees, but such conditions are exceptional ones and under them the same city would probably pay an excessive price for its pavements even if it eliminated the guarantee provision from its contracts. This condition could be and has been met by the establishment of large municipal plants capable of doing a considerable portion of the necessary paving.

It has also been urged that it is not logical or legitimate to ask for guarantees on pavements because buildings are not guaranteed. The cases are not parallel. The factor of safety in a building is much greater and its life expectancy is much longer. If the average life expectancy of a building were but ten years and defects might be expected to develop within five years, which might render it useless unless rebuilt, the cases might be more nearly parallel.

Having in view the facts as set forth in this report, your Committee believes that, notwithstanding its admitted defects, the guarantee clause serves an effective purpose and in the light of experience is economically justified.

We do not believe that a uniform length of guarantee for all pavements or for the same pavement under varying traffic conditions is logical or justifiable. Certain pavements are composed of blocks which in themselves have a very long life, and but little variation is to be looked for in the blocks themselves. Defects which would develop would be almost wholly defects of workmanship and two years should be the maximum period required to make this evident, and therefore, the guarantee should be limited to that time. Other pavements are composed of blocks which vary very greatly in hardness and resistance to wear and for this type we would advocate a guarantee period for the full life expectancy of the pavement without repair, as it is obviously impossible to test every block used in it. Where a pavement ultimately fails through the abrasion or disintegration of the pavement itself and is liable to prematurely disintegrate through improper materials, or mixing, or proportions, we believe that, owing to the great difficulty of absolutely preventing these errors by inspection, the pavement should be guaranteed for its full life expectancy without repairs and this can be reasonably varied to meet different traffic conditions.

We believe that the guarantee clause should be fairly worded so as not to impose upon the contractor responsibility for conditions arising after the completion of the pavement and over which he had no control, and as covering these points would recommend for consideration the form adopted by the Association for Standardizing Specifications at New Orleans in January, 1912. It should also clearly set forth and be agreed to by the contractor that he accepts the guarantee as being within the reasonable life expectancy of the pavement without repairs.

In northern latitudes if the pavement is completed and accepted between November 1st and May 15th, the guarantee period should be extended so that it will expire on the first of June first following, in order to insure weather conditions being such as to permit of thorough examination and the making of all necessary repairs before the final taking over of the pavement by the city. This provision may be omitted when climatic conditions render it obviously unnecessary.

Owing to the admitted defects and short comings of guarantees covered by surety bonds alone and the frequent difficulty experienced by cities in having even those repairs due to poor workmanship and materials made on time, we believe that the bond should be supplemented by a cash retainer, legal interest being allowed to the contractor on the amount retained.

For new construction involving grading, foundation and wearing surface we would recommend that 10 per cent of the aggregate cost of these items be retained.

For surfacing on an old foundation we would recommend a retainer of 20 per cent.

In the case of a 2-year guarantee the whole of the retained moneys should be payable at its expiration and not before. In the case of a 5-year guarantee, one-fourth of the retained moneys should be payable two years after the completion of the pavement and the balance in three equal annual installments. The date when payments of retained moneys become due shall be governed by the clause previously recommended for pavements completed and accepted between Nov. 1st and May 15th. If the contractor, having received 30 days' notice, fails to make and complete the ordered repairs at the time any annual installment (or the whole amount) of the retained moneys becomes due, he shall forfeit to the city the total amount then due unless he shall have obtained in writing from the engineer an extension of the time, when the same provision shall apply at the expiration of the extension period.

Francis P. Smith, chairman; J. F. Hill, C. M. Pinckney, B. H. Wait, T. J. Wasser, members of the committee

Municipal Journal

Published weekly at
243 West 39th Street, New York, N. Y.
by
Municipal Journal and Engineer, Inc.

S. W. HUME, *President*
J. T. MORRIS, *Treasurer* A. PRESCOTT FOLWELL, *Secretary*

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago

Contributed Articles and Reports

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

PAVEMENT GUARANTEES.

The report to the American Road Builders' Association of the committee on "Economic Status of Guarantees for Pavements on Roads and Streets," which is published in another part of this issue, was the subject of animated discussion by the convention and did not seem to meet with very general favor from the contractors present. It seems to us, however, that most of those discussing it did not fully appreciate the aim of the committee. Whether, understanding and agreeing with that aim, they would indorse this form of guarantee as attaining it is still an open question.

Briefly, we understand that the committee's idea was to limit the guarantee period to that necessary for detecting any features of workmanship or material that were not up to specification, and thus provide for only such repairing as might be called for by such defects. The committee specifically states that "it believes the two terms ('guarantee' and 'maintenance') should be regarded as separate and distinct, and that the guarantee period should not be longer than the reasonable life of the pavement without repairs except those rendered necessary by reason of defective materials or workmanship or both."

If there is to be any guarantee at all, one based on these premises would seem to be logical and just to the contractor. There remain for difference of opinion the question of guarantee vs. rigid specifications and inspection, and that of the method of applying this principle of guarantee. The former will form the subject of an article that we shall publish, probably next week.

As to the committee's idea concerning what is the "reasonable life of a pavement without repairs," they give five years as a maximum life, but believe that the period should vary with the kind of pavement and the traffic condition. In the case of certain block pavements, defects would be almost wholly those of workmanship and should develop within two years, and the guarantee would be limited to that time. But for those block pavements in which the blocks vary in hardness and resistance to wear and therefore might themselves be defective in spots, and for pavements that ultimately fail through abrasion or disintegration of the pavement itself, the duration of the guarantee should be full life expectancy without repairs, varied to meet traffic conditions. How to assign a definite period to this "reasonable life without repairs" that shall "vary to meet different traffic conditions" needs further elucidation, which will probably be given at the next convention, this having been accepted as a progress report. The assigning of a period that shall be fair to both parties and provide for increase in traffic seems to present serious difficulties. Possibly the use of a traffic census taken at stated intervals may be adopted in this connection, the guarantee period being a function of the traffic carried.

Considerable opposition was aroused by the last suggestion of the report, that a cash retainer be added to the bond, 10 per cent on new work and 20 per cent on resurfacing. The question is raised ,if surety bonds are so unreliable, why ask for them at all?

The committee is, we fully believe, anxious to develop a system of guaranteeing that, while it secures a good pavement to the city, will also be fair to the contractor, and will undoubtedly be glad to receive suggestion that will help toward the solution.

MUNICIPAL REVENUE AND REAL ESTATE TAXES.

The following letter from the director of the Bureau of Industrial Research of Indianapolis is self-explanatory. In the article in question, taxes on "real estate" are referred to a number of times, and only once is reference made to "land" taxes, which was a slip that escaped our notice. Although we do not admit that it expresses an incorrect idea, it at least does not cover the whole idea, in that the taxes are levied on buildings as well as on land. With this correction, we have no apologies to offer for the article. We did not intend to advocate or oppose any particular scheme of taxation, but only to set forth what different cities are doing. We realize that in general all taxes are paid by the ultimate consumer, different distributions of taxes, however, varying the allotment of the total amount of taxes among such consumers.

Municipal Journal, New York.
Gentlemen:

Please permit me to call your attention to your article on "Increasing Municipal Revenue," which appeared in the Municipal Journal for February 15, 1919, and to suggest that the writer of that article makes some very important observations which are by no means universally accepted as sound economics.

Specifically, on page 129, reference is made to the increase in the per capita tax collected from real estate since 1903, which has resulted inevitably in *"an increase in rent and in the cost of carrying on every kind of business, since all of these directly or indirectly pay the land taxes."* What we have here is the all too prevalent fallacy that rent enters into the price of commodities in exactly the same way and to the same extent that delivery or selling costs, for example, enter; whereas, to class rent in the same category with other costs is to confuse thought and lead to erroneous conclusions, exactly as it has done in the particular case under examination.

Note, for example, how this fallacy creeps into the last sentence of the paragraph from which the quotation previously made was taken. Here is a plea against heavier taxes on real estate, on the ground that an increase in such taxes would increase the burden of rent now imposed on the laboring classes, who are *"those least able to afford to pay them."*

Now, as a matter of accuracy, the writer should have distinguished between taxes on land and taxes on buildings or other improvements which are distinguishable from the land.

It is the rent of the latter only that is increased by taxation, through the effect of taxation on the supply of such goods; and these are the only real estate taxes that enter into the rents paid by laborers or by any one else. If cheaper rentals for laborers are desired, they can be secured, not by decreasing

the tax on land, but by increasing it, and by a corresponding deduction from the tax on improvements.

Another apparent slip appears on the same page, page 129, second column, second paragraph, where the writer cites with evident approval the fact that Birmingham secures 19.1 per cent of her revenue from business licenses. Can it be that such taxes, unlike taxes on real estate, do not enter into the costs of doing business, and hence are not shifted to the consumer and thus "unloaded so directly onto those least able to afford to pay them"?

Students of the tax problem generally admit that a tax on economic rent, the annual use value of land, cannot be shifted, and that every tax which must be paid out of the profits of business only makes the conduct of business more expensive and hence, in the majority of cases, adds to the price paid by the ultimate consumer. It is to be regretted that the writer of the article referred to did not have these two principles clearly in mind. If he had, he would not have implied such an unfavorable comparison between Des Moines and Birmingham. Of all the sources of additional municipal revenues, economic rent seems to offer the most hopeful possibilities.

Very truly yours,
RAY S. TRENT,
Director, Bureau of Industrial Research.

Twenty-five or thirty years ago, as an enthusiastic student, we read and listened to the words of Henry George. Since then enough has been written on his theories to fill a library. The limited space in Municipal Journal does not permit us to add to this literature, interesting as it would be to do so. As stated, we had and have no intention to express an opinion on the subject, but only to enable cities to learn what sources of revenue other cities are utilizing that they are not.

SPRINKLING FILTER FLIES.

Drowned by Flooding Filter Beds for Twenty-four Hours—Satisfactory Experience with This Method at Plainfield, N. J.

One of the objectionable features connected with sprinkling filters is the prevalence at most of them, during certain seasons of the year, of myriads of small flies. This fly is small and moth-like, 3 to 5 mm. long, the body and wings covered with fine hair. Millions will breed in a filter during a season. They may be carried by favorable winds three-quarters of a mile from the plant, but generally remain rather close to it. Ordinary window screens do not keep them out.

The result of experiments conducted at the sprinkling filters of Plainfield, N. J., was set forth by C. S. Beckwith, assistant entomologist of the New Jersey State Agricultural Experiment Station, in a recent issue of "New Jersey Municipalities." His statement was as follows:

In studying the habits of the flies it was determined that the breeding continues throughout the entire season. During the cold months they are present in the larval and pupal stages, emerging with the coming of warm weather. The abundance of the flies during the warm season seems to be correlated with the thickness of the film on the stones of the filter. A thick film means more flies, and a thin film, fewer flies. The thick film of late spring gives rise to a tremendous brood. After the film has broken down and sluffed off the number is greatly reduced. Again with the thickening of the film in late summer, the flies become abundant.

A study of the problem showed that under a temperature of 70 degrees Fahrenheit the fly requires from eleven, seventeen to nineteen days to complete its entire life cycle, distributed as follows: Egg stage 32 to 48 hours, larval stage 9 to 15 days and pupal stage 20 to 47 hours. These determinations were made under controlled temperature conditions, and the change in position of the stone on which the immature stages were located might either shorten or lengthen the period. It seems probable, however, that the effect of artificial conditions was principally shown in the variation in length of time above indicated. On the filter beds the completion of the life cycle may require much more time in lower temperatures or considerably less time in higher temperatures.

The study demonstrated that the control of the pest by the destruction of the adults was impracticable and that the attack must be made during the immature stages. The study also showed that in the larval and pupal stages the organisms live imbedded in the film and that during both stages they thrust their breathing tubes through this film to obtain atmospheric air. The problem of control was thus resolved into one of finding an agent which would destroy the larvae and pupae and not injure seriously the film on which the efficiency of the filter bed depends. A large number of chemicals were tried. Any of these, when usd in sufficient strength to kill the fly, also damaged the film.

In holding over samples of sewage filter film, Dr. T. J. Headlee unthinkingly covered them with water. When he examined the material the following day he found larvae and pupae dead, although other parts of the film seemed normal. This accidental observation, when correlated with the fact that the breathing tubes of maggots and pupae project through the film in such a way as to obtain atmospheric air, led to suspicion that the species could be controlled by drowning. The following table is the compiled result of three sets of experiments.

Results of Submergence Tests on Sprinkling Filter Fly.

Length of Time Flooded, Hrs.	Conditions of Larvae and Pupae	Condition of Film
16	Alive	Alive*
18	Alive	Alive
22	95% dead	Alive
24	Dead	Alive
32	Dead	Alive
36	Dead	Slight putrefaction
48	Dead	Putrefaction

*Organisms which largely compose the film alive.

It thus seemed that submergence for 24 hours destroyed 100 per cent. of the larvae and pupae.

To make the matter more certain, one-fourth of the Plainfield sprinkling filter, amounting to a little less than one-half acre, was submerged for a period of 24 hours with ordinary sewage water as it came from the dosing tank. At the end of this period the water was released and many samples were taken. Enormous numbers of larvae and pupae came out with the water, and not one could be found that was alive.

The sprinkling sewage filter beds at Plainfield have concrete containing walls with two outlet chambers leading across it. A permanent fixture permitting quick flooding was arranged by placing a weir furnished with a gate across the lower end of each outlet. During 1918, no serious brood of flies escaped from the filter bed, which, during parts of the summer, was flooded every ten days. The sprinkling filter fly can be controlled practically as well as experimentally by flooding the filter bed with sewage water for a period of 24 hours.

NEWS OF THE SOCIETIES

March 12.—VERMONT SOCIETY OF ENGINEERS. Annual meeting, Burlington, Vt. Secretary, Geo. A. Reed.

March 25, 26.—AMERICAN WATER WORKS ASSOCIATION, ILLINOIS SECTION. Eleventh annual meeting, Urbana, Ill. Secretary, G. C. Habermeyer, acting chief, State Water Survey, Urbana.

April 14-19.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Mineral Wells, Tex. Secretary, F. A. Rountree, Birmingham, Ala.

April 25-26.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, Logan Hall, West Philadelphia, Pa.

Nov. 12-14, 1919.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

AMERICAN ROAD BUILDERS' ASSOCIATION.

The sixteenth annual convention of the American Road Builders' Association, the ninth American Good Roads Congress and the tenth Good Roads Exhibit, held February 25, 26, 27 and 28 at the Hotel McAlpin, New York City, were very successful, the attendance being unusually large, the proceedings of value and interest, and the exhibits very helpful. On the whole it was universally agreed that the convention could be considered a good inauguration to the greatest highway construction season this country has ever seen.

The congress was called to order by president Arthur H. Blanchard in the ballroom of the hotel on Tuesday morning. Addresses of welcome were delivered on behalf of the state by Francis M. Hugo, secretary of state, and, on behalf of the city, by commissioner of public works M. L. Loughman. State highway commissioner Duffey, who was to welcome the convention on behalf of the department, was unavoidably absent. Secretary Hugo said: "We are particularly anxious now to connect the main highways of the state by completing in the best possible manner the bad stretches of road between them and which are a great detriment to efficient highway transportation. The cost is estimated at $25,000 a mile, and the highway department hopes to finish sixty miles this year." Mr. Hugo said that with the $15,000,000 remaining from the second $50,000,000 bond issue there is a total of $17,000,000 available for the New York road program, but all of the money will not necessarily be spent in one year. As an encouraging example that a reasonable supply of labor would soon be available at fair wages he cited the fact that in the previous week the highway department awarded a bid for $77,000 to complete one of the Barge Canal terminals, the estimated cost of which, based on war prices, had been placed at $99,000. Twenty-two contractors submitted bids. He also described the registration of motor vehicles by his office. He discussed the sharing of license fees with local governments and also the relation between unemployment and road building.

In an address entitled "Building for the Future" Andrew H. Phelps, secretary of the eastern district, Chamber of Commerce of the United States of America, pointed out that the increasing development of foreign trade must be aided by improved interior transportation routes. He said better roads must be provided to carry, economically and speedily, manufactured and farm products to the ports.

P. St. J. Wilson, acting director of the U. S. Bureau of Public Roads, read a paper on the "Operations of the Bureau of Public Roads Under the Federal Aid Act." He declared that the resulting benefit of the act to highway construction throughout the country had already proved its wisdom. He said that the terms of the act require efficient state departments, with the result that the departments have been greatly strengthened. At the time of the first appropriation there were seventeen states without highway departments. Now all states have them. Comprehensive programs have been submitted by most of them, and real systems have been mapped out instead of the small, disjointed sections of county highways existing before. He said that thirty-nine states have submitted adequate plans and standard specifications. He pointed out that the restrictions and difficulties due to the war had interfered with all plans. He declared that the benefits of the act had been delayed one year, but that we were now at the beginning of the greatest road building era we have ever seen. He gave statistics of projects approved and in various stages of development, and estimated that probably $100,000,000 would be used on such work this year. He said an important step toward stronger and more permanent road building was made when the government increased from $10,000 to $20,000 the amount which it would appropriate under the federal aid act toward the cost per mile. This makes it possible for the states to build good roads up to a cost of $40,000 per mile, which virtually insures the best construction for motor transport and other heavy usage. The broadened definition of "post-road" in the new post-office bill would further extend federal aid.

F. G. Macdiarmid, Minister of Public Works and Highways of Ontario, who was to have spoken on "The Highway Situation in Canada," was absent because of illness.

Tuesday Afternoon.

The opening paper of the afternoon session was "Efficiency of Bituminous Surfaces and Pavements Under Motor Truck Traffic," by Prevost Hubbard, chemical engineer, U. S. Bureau of Public Roads. He pointed out that a large proportion of pavement failures under war-time conditions of lack of labor and engineers and of heavy traffic were complete failures, involving the simultaneous destruction of the whole structure, including the base. This, he said, proved that the wearing course can have no efficiency value in itself and that the pavement depends on the base. In this connection he discussed the question of thickness of base and the effects of weather. He pointed out that under heavy traffic internal movements in the pavement are transmitted, and that just as a slab foundation has been found necessary in city streets so it should be used on highways under heavy traffic. He declared that bituminous pavements had proved themselves efficient under modern traffic conditions if constructed with proper foundations. He cited as an example the road from Camp Beauregard to Alexandria, La. The road is of the same construction throughout, but under the heavy army traffic during the spring thaw the part outside the city was ruined in a few weeks, while within the city it stood up well. The failure, he said, was due to sub-grade conditions. Mr. Hubbard recommended the patrol system of maintenance. He said that bituminous macadam formed a satisfactory road when built on a proper base. He urged more care in distribution of asphalt in order to make pouring uniform and not too fast. He was inclined to favor hand-pouring. He emphasized the necessity of proper compacting and better aggregate grading, and favored the use of a binder course.

In the discussion of this paper F. P. Smith (Dow & Smith) declared that because broken stone has no "slab effect" he preferred telford foundations to macadam. Stone should be such as to withstand shattering effect, which had bad results. He called Topeka a "hybrid between sheet asphalt and bituminous stone mixture," and declared it to be dangerous except under very competent supervision because the smallest variation in bitumen content was liable to cause failure. He ascribed to sheet asphalt a high degree of stability. Charles H. Neal (Asheville, N. C.) thought that the danger of cracking under heavy traffic was greater in the case of concrete foundations than of macadam. Mr. Hubbard stated that the U. S. Bureau was investigating the problem of friction between concrete base and sub-grade. Further discussion, participated in by E. H. Thomes (highway department, Borough of Queens, New York), F. A. Reimer (county engineer, Essex County, New Jersey), F. E. Ellis (manager, Trap Rock & Construction Co., Melrose, Mass), and others present, emphasized the neces-

sity for care at all points during construction and that extra thickness of foundation is not always economical.

Major W. M. Acheson, division engineer, New York state highway commission, read a paper on "Present Status of Brick Pavements Constructed with Sand Cushions, Cement Mortar Beds and Green Concrete Foundations." He described the progress made in brick pavement design since 1915. He discussed cement concrete foundations. Sand cushions, he said, provided uniform bearing and resiliency under traffic, and must be uniform and compacted. He said that wetting and drying causes voids and the sand is forced up into the pavement. The more recent types of brick, which are larger and had wire cut lugs, give better construction. In the case of cement grout filler, which he said is more durable, he preferred machine mixed grout. He traced some types of brick pavement failures to the sand cushion. Taking up semi-monolithic pavements, he said this type overcomes the defects of sand cushions, such as shrinking and noise, by uniting the surface with the foundation by means of the sand-cement cushion. He said that brick of less than standard depth would prove satisfactory. He described a mechanical template operated by gasoline engine. He declared that heavy truck traffic demanded a rigid type of construction.

Discussion by Will P. Blair (vice-president, National Paving Brick Manufacturers' Association), Mr. Thomes and others followed.

In the absence of A. D. Williams, formerly chairman of the West Virginia state road commission, who was to have presented a paper on "Recent Developments in the Construction, Maintenance and Reconstruction of Cement-Concrete Pavements," the subject was informally taken up by some of the members present. W. G. Sucro (road engineer, Baltimore County, Maryland) pointed out that some concrete road failures were due to width inadequate for carrying all heavy traffic passing over the road. He said that reinforcing may be necessary at times, but he did not feel that it adds materially to strength; and on the whole, from his experience, he felt that concrete is not advisable under all conditions. C. M. Upham (chief engineer, Delaware state highway department) stated that, as a result of experimenting with reinforcing during two or three years, he had found no appreciable benefit. In the experiments reinforcing had been placed under different conditions in different slabs in the actual road. As this work was with reinforcing of only 0.2 per cent of cross-section area he could not give final opinions on greater reinforcing, which appeared to be necessary to get results.

At the request of president Blanchard, Nelson P. Lewis (chief engineer, Board of Estimate and Apportionment, New York City) described might benefit during the coming period of construction activity. The paper was discussed in an interesting way by a number of members, including Nelson P. Lewis, F. E. Ellis, F. A. Reimer and Halbert P. Gillette (editor "Engineering and Contracting").

Nelson P. Lewis, chief engineer, Board of Estimate and Apportionment, New York City, presented a paper on "The Relation Between Street and Rural Highway Systems." He declared that the time had come when the street system of a city and the surrounding highway systems should be considered as one great system rather than as separate units. It is common, he said, to have difficulty in finding the most direct route between towns or the best exit from or approach to a city. He said that lack of co-ordination is apparent in both city and rural systems. Traffic between centers of population frequently has to pass minor and unattractive streets, he said; and, on the other hand, where county or state highways leading to cities are being improved care should be given to alignment, grades, cross-section and drainage and tree planting. He then cited instances of thoroughfares through congested traffic centers in cities, which might have been avoided by planning. He discussed the question of joint improvement by state and town of state highways running through towns, and brought out both sides of the case where the municipality refuses to co-operate. His solution to the problem of securing prompt improvement of the entire trunk highway in such cases was that "the state should be able to secure this result, but without injustice to communities where the imposition of the share of the cost determined by statute would involve serious hardship." He said that power to carry out the improvement should be vested in the state, "which would become responsible for payment for the work in the first instance, and that the town should be obliged to contribute such share as may be designated by law, provided the law so specifies, with the right of appeal to some high judicial body, which would have the power either to decrease or increase the proportion fixed by statute, the decision in each case to be reached after careful consideration of all the circumstances, including population, the assessed value of real estate in the town, its existing debt and tax budget in relation thereto, the amount of traffic originating in the town, the need of other improvements, the width of its streets in proportion to their traffic, and probably other factors which would be essential to a fair determination of the issue." He ended by urging thinking in larger terms of city, state and county highway systems as only parts of a great national enterprise.

Tuesday Evening.

The Tuesday evening session was a "picture evening." The Barrett Company presented motion pictures, including construction scenes, in a film entitled "Building the Roads of a Military Cantonment." Warren Brothers Company exhibited "Columbia River Highway, America's Greatest Highway Paved with Warrenite," which displayed some of the scenic wonders of that road, as well as construction views. An illustrated lecture on "Brick Pavements" was then delivered by Will P. Blair, vice-president of the National Paving Brick Manufacturers' Association.

Wednesday Morning.

"Efficient Methods of Contracting for Highway Work During the Reconstruction Period" was the title of the first paper, which was read by John H. Gordon, president of the New York Road Builders' Association. More effective and more equitable contracts were urged in order that all parties conditions in France which he had investigated as member of a commission of American engineers, delegated to take up reconstruction problems with the French engineers. He said that, although most of the French water-bound macadam roads, which are better than those here, are in good condition, the road system would now have to be rebuilt to withstand heavy traffic and would probably be surfaced with asphalt. He said that, while the French engineers had learned some efficient methods from Americans, they were not inclined to build other types of roads, such as concrete and brick. From his discussions with French authorities he did not think that they were in a position to offer any attractive proposition to American contractors in the work of road reconstruction. He said that industrial conditions in France are unbalanced and that there was doubt as to the possibility of repopulating some of the devastated areas. He estimated the total physical destruction in France to be repaired at thirteen billion dollars.

"Cost Keeping for Highway Contractors," by H. P. Gillette, editor-in-chief, "Engineering and Contracting," was the next paper presented. (This valuable contribution will be printed in a forthcoming number. In the discussion Mr. Francis (Delaware) suggested that the cost of installing and moving equipment be included in contract estimates and prices, and Mr. Gillette agreed that such a course might prove desirable. Before leaving the platform Mr. Gillette expressed his indignation at the common references by newspapers to the federal road aid legislation as "pork-barrel" measures. He urged that all present should take up such references with the editors and educate them out of careless and ignorant views in confusing highway aid with post-office and similar appropriations.

A. D. Williams, former chairman of the West Virginia State Roads Commission, supported Mr. Gillette's protest, and then discussed the topic

which he was to have presented the previous afternoon—"Recent Developments in the Construction, Maintenance and Reconstruction of Cement-Concrete Pavements." He reviewed developments in methods and recounted his experiences. In speaking of joints he recommended the submerged or invisible ones. He described the decided development in surface finishing methods in the past three years leading up to the most effective method—the Macon roller. In regard to reconstruction, he foresaw an increasing tendency to resurface old concrete with 2½-inch or 3-inch second tops. In making repairs he advised that defective parts be cut out and replaced by concrete of the same mix. He urged care in getting cracks perfectly clean before using tar or asphalt compositions for repairs. The colorimetric test of fine aggregate, he said, opened up a wider range of available materials, and cited the use of sandstone in West Virginia, which had before been considered impracticable, but which was found to give a better surface than gravel. He looked forward to new developments, and particularly turned to mechanical engineers for new machines.

"Foundations for Heavy Horse-Drawn and Motor-Truck Traffic" was the subject of a paper, illustrated by stereopticon pictures, by C. M. Pinckney, chief engineer of highways, Borough of Manhattan, New York City.

Colonel W. G. MacKendrick, road engineer for the fifth British army in France (formerly president of the Warren Bituminous Paving Company, Toronto, Ont.), was requested by president Blanchard to recite some of his experiences. In a vividly colorful and highly entertaining narrative Colonel MacKendrick told of road construction near the firing line and the difficulties of maintenance under terrific army traffic. He was of the opinion that light railways, as used extensively by the Germans, were better than continuous highway construction near the front. Finding it impossible to build ordinary roads over shell-hole areas he finally was able to construct effective roads of planks, covered with macadam top.

Wednesday Afternoon.

"Economic Utilization of Labor-Saving Road Machinery," by Charles M. Upham, chief engineer, Delaware state highway department, was the first paper at this session. It was illustrated by stereopticon pictures. The paper took up more specifically equipment and methods in connection with concrete highway construction, including machinery for mixing, laying, finishing, handling materials, etc. Many of the illustrations were construction scenes on the well-known du Pont road in Delaware.

A progress report was then presented, and accepted by the convention, by G. P. Coleman, state highway commissioner of Virginia, and chairman of the committee on "Convict Labor on Highway Work: Organization, Administration, Camps and Cost Data." He described convict labor practice in his state and suggested principles. He advised that the superintendent of work and the sergeant of guards be one man in order that disciplinary and work conditions be controlled by him rather than under dual authority of representatives of both the prison and highway departments. Sanitary arrangements on Virginia work are under the state board of health. Commissioner Coleman was in favor of convict labor because of its good effects on the men, as well as the benefits to the state. That the men become good workers he proved by the fact that 25 to 30 per cent. of discharged prisoners are employed by highway contractors. He urged that all able-bodied convicts should be given work on the roads and that the highway department be invested with all authority over them. In Virginia the men are divided into four classes, according to character, offense and term of sentence. The convicts are paid ten cents per day (at the end of their terms).

A letter was read from Dr. E. Stagg Whitin (chairman of the executive committee of the National Committee on Prison Labor), a member of the committee. Dr. Whitin urged that convicts be paid reasonable wages, equal to those of free labor. Commissioner Coleman disagreed with this view. E. E. Reed (assistant state highway engineer, New Jersey) described conditions in his state, where some convict labor has been used since 1912. This year the department will prove to the labor unions that convicts are being paid a rate equivalent to that of free labor. The overhead cost (including maintenance) to the prison department amounts to $1.50 to $1.75 per day per man, and to the highway department the overhead cost is twenty-five cents a day. Convict labor is considered 50 per cent to 100 per cent. efficient (average of 75 per cent). With a free wage scale of $3 a day convicts are therefore worth $2.25, and deducting $2 costs, twenty-five cents per day is left as allowance.

Paul D. Sargent, chief engineer of the state highway department of Maine, then presented a report as chairman of the committee on "Sources of Supply of Unskilled Labor for Highway Work." (This valuable report, already the subject of an editorial in Municipal Journal of March 1, will be printed in full in a later issue.)

Discussion on this report was opened by Leslie Willis Sprague (U. S. Department of Labor.) He declared that during the present period of readjustment there is need for "buffer" employment and that highway work is most favorable for this. Foreseeing a period of labor shortage when work is really resumed, he urged that all available labor be used now; but warned against making work simply for the sake of making it. He appealed to the patriotism of employers and public officials to hasten resumption of normal labor conditions.

Wednesday Evening.

This session was devoted to the annual dinner of the association, which was held at the Waldorf-Astoria Hotel. It was a stag dinner affair, with redeeming features of no after-dinner speeches and no formal dress. General T. Coleman du Pont, who was chairman of the local entertainment committee, presided. After the dinner there was a well-received vaudeville show. Between six and seven hundred were present at the dinner.

Thursday Morning.

A joint session of the American Road Builders' Association, American Automobile Association, Highway Industries Association and the National Highway Traffic Association was held Thursday morning, at which the reports of committees were received.

Willis Whited, bridge engineer, Pennsylvania state highway department, as chairman presented a report on "Methods of Strengthening and Reconstructing Highway Bridges for Heavy Motor-Truck Traffic." (This report will be reprinted in a forthcoming issue.)

The report of the committee on "Reconstruction of Narrow Roadways of Trunk Highways with Adequate Foundations and Widths for Motor-Truck Traffic," presented by the chairman, H. E. Breed, first deputy highway commissioner of New York, was followed by interesting discussion. It was recommended that in widening roads the widening strips should have the same foundation and same depth as the rest of the road. Mr. Blair (Paving Brick Manufacturers' Association) was of the opinion that the maintenance of road sides cost more than that of the wearing surface. Commissioner Sargent (Maine) gave illustrations of this point from experiences in his state. Three-foot macadam shoulders on a concrete pavement had cost $250 per mile annually on one road and $200 on another. He found that one foot of additional width on a sixteen-foot road would reduce the maintenance to practically nothing. He said that the main damage was caused by the outer wheel of each line of traffic.

George H. Pride, president of the Heavy Haulage Company, as chairman, presented the report of the committee on that vexed question, "Regulations Covering Speed, Weight and Dimensions of Motor Trucks." The report was brief, merely stating that because three of the engineer members of the committee came from states where the legislatures were considering bills contradictory to the opinions of the majority of the committee and could therefore not concur, no regulations were adopted by the committee after months of labor. The report started one of the liveliest discussions of the

convention, and Mr. Pride, with excellent good humor and keen replies, was kept busy from the floor. The members present felt that definite regulations should be adopted by the association and used for educational purposes among the legislators considering the subject. They began then and there to thresh out the whole matter. The relation between manufacturer and user was discussed, and Mr. Pride pointed out that the manufacturer would make only those trucks which the user found it economical to use. He said that the transportation business is new and small, and that a line between New York and Boston, for instance, would be possible with 7½-ton trucks and not with 5-ton. He foresaw increasing use of large trucks with high tonnage by farmers, and that weight limits less than 28,000 pounds would mean inadequate transportation. He said that at present trucks are being overloaded 50 per cent and highways are being worn faster than if 7½-ton trucks were permitted. George C. Diehl (chairman, Good Roads Board, American Automobile Association) pointed out that different roads can carry different loads, and that if load is limited traffic would be increased; that doubling width cost more than doubling carrying capacity. Mr. Pride presented the majority maxima for truck regulations, and these were taken up by the members. Mr. Whited (Pennsylvania) urged that distribution of load two-thirds on rear axle and one-third on front be required in order to safeguard the bridges. Mr. Pride answered that trucks were not built that way. At the suggestion that excess license fees be levied on very heavy trucks to make such transportation prohibitive, Mr. Pride declared that the case was not one between truck manufacturer and highway builder, but was "the people vs. the people." He said that illiberal limitations on trucks would result in higher costs of transportation, and consequently higher costs of food and other products. Major Frederic A. Reimer (county engineer, Essex County, N. J.) urged that the meeting go on record as favoring the incorporation of the standards in the New Jersey motor vehicle law in the association's standards, since the former were similar to those in the committee's report. President Blanchard pointed out technical objections to this course. Mr. Pride declared that the New Jersey law is not enforced, and was unenforceable because it did not conform to truck construction practice. Mr. Diehl presented the standards of the committee in the form of a resolution, which was referred to the resolutions committee.

Thursday Afternoon.

The second joint session was opened with a motion picture, "Ocean to Ocean by Motor Truck," by H. S. Quine, secretary to the president of the Goodyear Tire & Rubber Co.

George H. Pride, formerly a member of the Highways Transport Committee, Council of National Defense, read a paper on the "Inter-Relationship of Highways, Railways and Waterways," in which he enumerated the functions of each mode of transportation, and urged that the problem of transportation be considered comprehensively.

"National Highways" was the subject of an address by General T. Coleman du Pont, chairman, Board of National Councilors, National Highways Association. He made a plea for highways of national scope and national value.

Edward J. Mehren, editor, "Engineering News-Record," presented the report of the committee on "National Highways," dealing with a federal highway commission and a federally controlled highway system.

Following the session, a number of members accepted Commissioner Loughman's invitation on behalf of the city to take 'bus inspection trips to scenes of interesting public work construction.

Thursday Evening.

This was a motion picture session. The Granite Paving Block Manufacturers' Association presented "Production and Construction of Granite Paving Blocks and Curbs." The Koehring Machine Company showed a film illustrating "Modern Methods of Grading and Handling Materials." "Good Road Building" was the title of a film exhibited by E. I. du Pont de Nemours & Company.

Friday Morning.

Chairman H. G. Shirley, secretary, Highway Industries Association, presented a report of the committee on "Civil Service Requirements for Highway Engineering Positions."

"Efficient Methods of Promoting Highway Bond Issues" was the subject of a paper by S. E. Bradt, state superintendent of highways of Illinois, which gave valuable practical advice to those concerned with educating the public to highway needs.

Nelson P. Lewis, chief engineer, Board of Estimate and Apportionment of New York City, presented a report of the committee on "Methods of Financing Highway Improvements for States, Counties and Towns." The report advised more careful and conservative methods of financing in order that the burden be equitably distributed.

The report of the committee on "Economic Status of Guarantees for Pavements on Roads and Streets" was read by the chairman, Francis P. Smith, and discussed by George C. Warren, G. M. Ingram, F. A. Reimer, A. P. Folwell, F. E. Ellis and others. (This report is printed in this issue.) Mr. Warren advocated a life of guarantee covering not the reasonable life of the pavement, but one sufficient to detect poor workmanship. Failures due to conditions not within the contractor's control are the most common cause of contention between cities and contractors and bonding companies. He claimed that the contractor must add to his bid more than the mere cost of securing a bond, several times this being necessary to cover the uncertainties involved in guaranteeing. Retaining 20 per cent of the payment, he insisted, was disadvantageous to both the city and the contractor. Mr. Ellis stated that his firm was so opposed to guarantees that it would take no work where they are demanded. Mr. Reimer also questioned the advisability of guarantees, and thought that engineers generally were coming to this opinion. Mr. Folwell stated that of 100 city engineers in all sections of the country 45 favored guarantees, 35 were opposed to them and the remaining 20 expressed no opinion. (The details of opinions from several hundred engineers will be given in Municipal Journal probably next week.) What cities wanted was not the contractor's money, but absence of necessity for repairs, and that plan was best that would best accomplish this. Mr. Winslow stated that in some states, at least, cities cannot be sued and the contractor cannot recover a retained percentage by legal action. Questions by president Blanchard brought out that New York and some other, if not all, states were similarly protected against law suits, but that they can be sued by consent of some state authority, and this probably never would be denied if there was any shadow of a just claim. The report of the committee was accepted as a progress report, without any vote being taken on the adoption of its ideas.

Friday Afternoon.

The session opened with an interesting illustrated lecture on "The Motor Vehicle in Warfare" by John R. Eustis, secretary, Motor Truck Board, American Automobile Association.

The report was then presented of the committee on "Uniform Highway Signs," of which Robert A. Meeker, consulting engineer, Newark, N. J., was chairman. Standard signs as adopted by the county engineers of New Jersey were shown and discussed.

The report was presented of the committee on "Efficient Methods of Snow Removal from Highways Outside of Urban Districts," of which Charles J. Bennett, highway commissioner of Connecticut, was chairman. Captain J. A. Duchastel, city engineer, Ontremont, Canada, discussed methods in his town, and described a successful machine developed recently.

Frederic E. Everett, commissioner of highways of New Hampshire, read a paper entitled "Methods of Maintaining Highway Systems Prior to Construction by the State or County." Various methods were described and practice in a number of states discussed.

(An abstract of Mr. Pinckney's paper on "Foundations for Heavy Horse-Drawn and Motor Truck Traffic," the full text of the resolutions adopted by the convention, and a list of exhibitors, will be published next week.)

Municipal Journal

Volume XLVI NEW YORK, MARCH 15, 1919 No. 11

USE OF RAINFALL RECORDS*

Gauges Should be Established Relatively Short Distances Apart Throughout the Country—Variation in Rainfall Rates of Different Areas—Mass Diagrams—Evaporation and Run-off.

At the December meeting of the New England Waterworks Association, there was read a letter from Robert E. Horton suggesting that an effort be made to get officials in charge of waterworks to establish rain gauges on the watersheds upon which their water supplies depend. While there are a fairly good number of rain gauges already established in various parts of New England, the number might be greatly increased to advantage, especially if they could be located in sections not already well supplied. In a paper before this society by X. H. Goodnough, it was shown that the southeastern section of New England is well supplied with rain gauges, but in the remainder of New England they are very widely separated. Many of the latter sections are well elevated and contain many streams, thus furnishing opportunities for reservoirs, dams, etc., for the development of power or water supplies.

It is proposed in this paper to give a few simple illustrations of the ways in which rainfall records may be put to practical use in the study of questions relating to water power and water supply, with a view to encouraging the establishments of additional gauges.

One advantage to be gained by having gauging stations located at relatively short distances apart would be to check the results obtained at other stations and correct any variation which may appear in the gauging due to special or unusual topographical conditions in the water shed, such as elevation; nearness to large hills, mountains, or water surfaces; directions of prevailing winds; etc. As the amount of rain that may be expected to fall on a given district is often the only basis upon which its value as a power or water producer can be formed, it follows that it is desirable to have the very best data that it is possible to obtain on that vital point.

It may be thought that with so many rain gauges already set up, especially in eastern New England, it would be easy to obtain accurate and reliable data for almost any location in that section; but anyone not familiar with the subject will be surprised and puzzled at the wide variation in the results obtained at locations not far apart, which often renders any close estimates impossible. As illustrating this fact, the following table has been prepared showing the average rainfall at various stations for a forty-year period ending 1913, and also the rainfall for the exceptionally dry years of 1880 and 1883, which for some purposes it might be desired to use:

*Paper before the New England Water Works Association, by L. M. Hastings, city engineer of Cambridge, Mass.; slightly condensed.

Average Rainfall at Several New England Localities.

Location.	Average Yearly Rainfall 1874-1913 40 Years.	Rainfall For Year 1880.	Rainfall For Year 1883.
*Manchester, N. H.	38.27	27.50	31.47
Concord, N. H.	38.63	30.48	31.35
Lowell, Mass.	42.01	35.28	39.84
Waltham, Mass	43.36	31.73	29.32
Cambridge (Harvard College)	43.49	35.22	32.65
Framingham (Sudbury River)	44.26	37.87	31.95
New Bedford, Mass.	46.65	40.06	43.51
*Providence, R. I.	47.20	41.29	39.54

*Manchester and Providence are only about eighty miles apart in a straight line.

From the above, it will be seen that even for a long-term period the average amount of rainfall at the points named varies greatly, the extreme variation being 8.93 inches or about twenty-three per cent., while for the dry year of 1880, the extreme variation is 13.99 inches, or over fifty per cent. From this it will be seen that anyone attempting to design a water power or a water supply system for a water shed at all remote from a long established rain gauge must unavoidably base his estimates upon data which have a large element of uncertainty in the makeup.

It has been stated by some writers that a rainfall record of from thirty-five to forty years makes that record fairly reliable as a basis of estimates for the expected average yield of a water shed. While this may be true in an ordinary period, an examination of the rainfall records of the last forty years of the Sudbury river water shed and others which have commonly been used in this vicinity shows that a marked change in the amount of rainfall has occurred during the last fifteen years of that period and that while the average for the forty-four years since the Sudbury river records were begun is 44.66 inches, the average for the period 1904 to 1918 (fifteen years) is only 40.97 inches.

The Stony brook rainfall record of the Cambridge Water Works in Waltham, Mass., shows a similar change. While the average rainfall for the entire period of twenty-nine years the gauge has been established—1890 to 1918—is 41.53 inches, the average for the period 1904 to 1918 (fifteen years) is 38.75 inches.

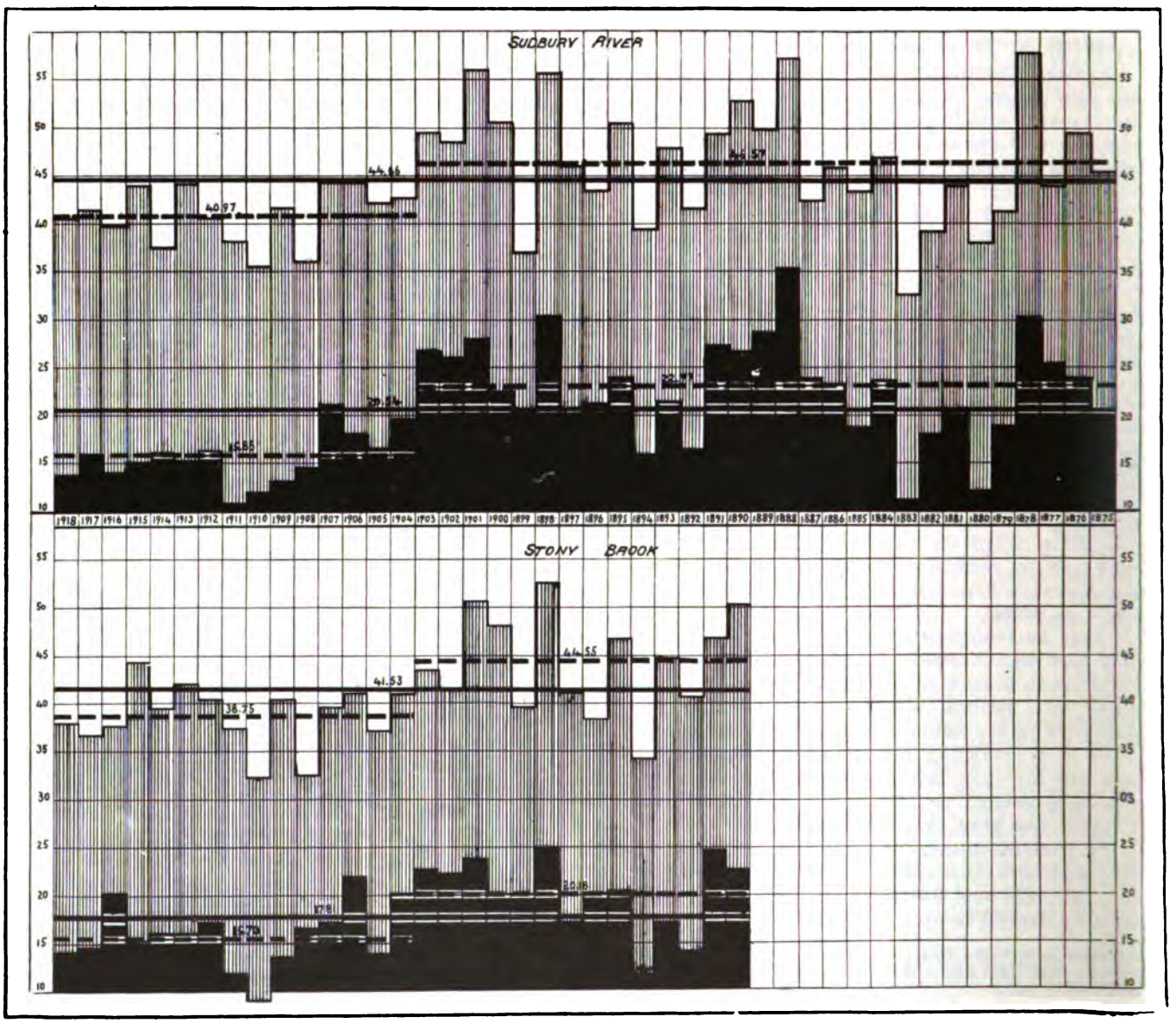
These last are remarkably low rates for so long a period and there seems to be but one period of that length of time with so low a rainfall record in this vicinity. This is in the Cambridge record of Prof. John A. Winthrop from 1760 to 1775, where the average rainfall is shown as 37.38 inches as given by Mr. Goodnough in his paper already referred to.

Still further, the record of the yield or run-off for both these areas shows a corresponding persistent decrease. While the average run-off from the Sudbury river area for the forty-four years is 20.54 inches, the average run-off for the last fifteen years is 15.85 inches. On the Stony brook area the average run-off for the twenty-nine years is 17.81 inches, and the average run-off for the last fifteen years is only 15.70 inches.

If these records are analyzed by percentages, the interesting fact is shown that in the dry periods, the *proportion* or *percentage* of run-off to rainfall is less than that in the wet periods. Thus, for the wet period in the Sudbury river area 1875 to 1903, the run-off was 49.3 per cent. of the rainfall; for the dry period 1904 to 1918, it was only 38.7 per cent.; for the exceptionally dry year of 1883, it was 34.1 per cent., and for the year 1911, it was 28.1 per cent. Similarly on the Stony brook area, for the wet period 1890 to 1903, the run-off was 42.9 per cent. of the rainfall. In other words, a *diminished proportion* of run-off. From these facts, it is evident that it may not be safe to draw conclusions even from a forty-year record, without a careful study of the records of other places and other periods that proper allowance may be made for abnormal results which may have been obtained.

There is another rather curious fact shown in the records for the year 1909 which may be noted. While the rainfall for this year, is about six inches *more* than for either 1908 or 1910, the *run-off* for 1909 is about 1.50 inches *less* than for the year 1908. The Stony brook record shows the same peculiarity—a lessened run-off in a year of increased rainfall. The explanation of this anomaly may be that the underground storage had become so depleted by the continued drought of a number of years previous that the increased rainfall for the one year failed to restore the deficiency in this storage and so could not increase the run-off for that year.

A very important and interesting question may be raised just here. Will the diminished rainfall as noted during the last fifteen years be permanent or will the rate "come back" to its old level? While no definite or authoritative answer can be given to this query, two things should be remembered in this connection. No permanent marked changes ever take place in the processes of nature without adequate cause. No such adequate cause is apparent by which the rainfall of this section could be permanently diminished; and again, in the past, marked changes have occurred in meteorological conditions, cold winters, hot summers, wet and



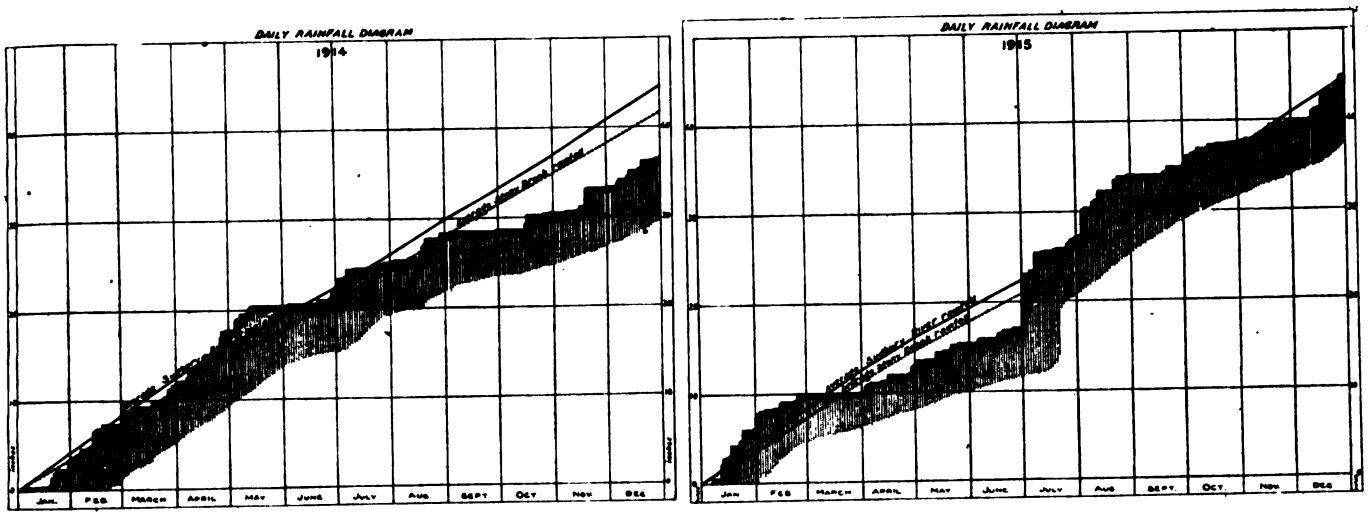
RAINFALL RECORDS, SUDBURY AND STONY BROOK WATERSHEDS.

dry seasons—some continuing for considerable lengths of time, but inevitably the balance has been restored and the general mean of conditions re-established. Even if the period of low rainfall given in Prof. Winthrop's somewhat fragmentary records be taken as reliable as showing the entire rainfall for that period, the records of other observers for following years show the amount of rainfall to be well up to or above the average.

and that long-time records obtained on or near the ground are most reliable and satisfactory.

The cost of an ordinary rain gauge (not automatic or self-recording) is small and its care and maintenance require only the attention which can be given to it by some intelligent employe on the ground, or by some resident for a nominal sum.

If it is desired to obtain automatic records of the rainfall,



FIGS. 2 AND 3—RAINFALL MASS DIAGRAMS FOR THE SUDBURY WATER- SHEDS, 1914 AND 1915.

A very practical and convenient way of using the daily rainfall records is by plotting them in the form of a mass diagram. Probably one of the most common inquiries a superintendent of waterworks has to answer is one relating to the condition of the reservoir as regards the supply in storage. Much misconception frequently exists in the "average citizen's" mind as to the amount of rain which has fallen prior to a given date and consequently as to the amount of water which has been received into the storage basins. If the returns are plotted on the prepared skeleton or frame of the diagram at weekly or monthly intervals, a glance will show the total amount of rainfall to date, and also whether that amount is more or less than the average amount of rainfall up to that time.

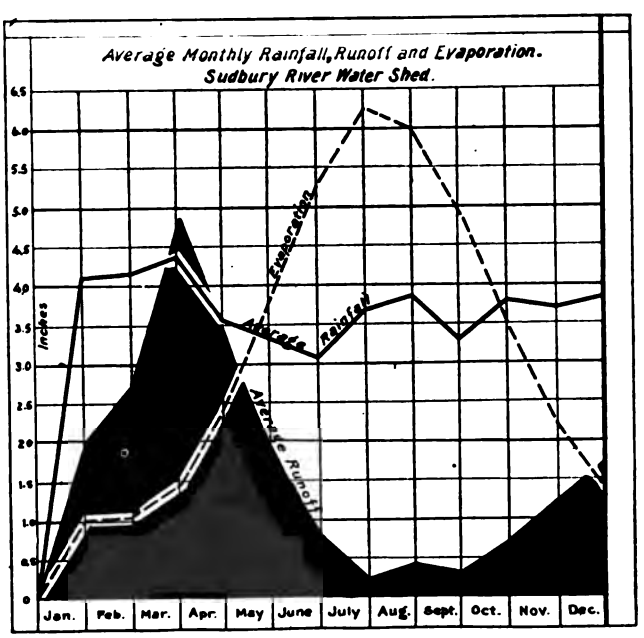
It is rather a curious fact that, taking the average rainfall for each month for a long term of years, these averages differ but little, the rainfall of the so-called "dry months" being on the average but little less than that of the wet months. The greatly increased evaporation during the hot months, together with the demands of growing vegetation, etc., makes the rainfall seem much less than it really is and also results in a greatly decreased run-off during those months.

As the evaporation from ponds, brooks, reservoirs, etc., amounts to over thirty-nine inches during an average year, it will be seen that the presence of large water surfaces in a water shed may have an important bearing on the amount of run-off to be expected from it. The accompanying diagram shows very clearly the relation between the average rainfall, evaporation and run-off as they occur in the Sudbury river watershed.

The distribution of the rainfall during the year has an important bearing on the amount of the yield or run-off. If the rainfall is largely during the season when the ground is frozen, a much larger run-off may be expected than if it occurred during the hot months, when the ground is dry and the evaporation rapid. This distribution and also the accumulated amount of rainfall to any date during the year are shown in Figs. 2 and 3.

From the above, it will be seen that rainfall records can be made to serve a variety of practical purposes, a more complicated and expensive type of gauge can be installed, and data obtained very useful in the study of many questions not covered by the mere *quantity* of rainfall, especially such as relate to the time at which the rainfall occurred and its intensity or rate per hour at any given time. These data are very interesting and sometimes are exceedingly valuable as factors in calculating the necessary strength and height of dams, length of spillways, size of culverts, damages threatened by floods, overflows or washouts, raising or lowering of the water in storage reservoirs, and a great variety of other questions of a similar nature.

If a watershed is large and the works established upon it are important and involve a large investment of capital, the establishment of an automatic rain gauge is strongly recommended.



RAINFALL, EVAPORATION AND RUN-OFF, SUDBURY WATERSHED.

A GARBAGE CREMATORY WITH SELF-RESPECT

That of Spokane, Washington, Finished in White to Compel Cleanliness, and Parking Development of Grounds Carried Out—Showers and Rest Room for Employes—Systematic Plans for Storing Materials.

By ARTHUR E. PETERSON.*

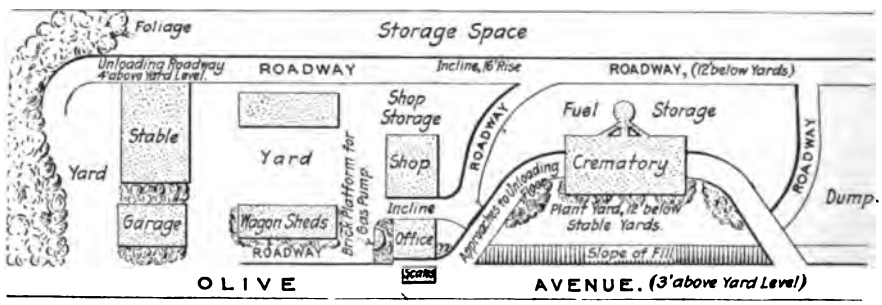
It seems strange that the average American municipality will build a beautiful city hall, well appointed and located, but will erect all other buildings required in out-of-the-way places, using bad designs and finishing in dull colors, and maintain them in a state of semi-disrepair. This is a real and serious state of affairs which calls for deserved condemnation and correction.

Because of their reputations as bad neighbors, crematory plants too often are placed in inaccessible locations and then, if the public will allow it, are neglected and abused by the responsible authorities. This condition in a great measure accounts for the notoriety achieved by the American crematory plant. Waste disposal plants are naturally the accumulating centres for wastes of all descriptions, of little or much value. The accumulations are almost invariably scattered about the plants and grounds in a haphazard manner. This practice has a very marked tendency to decrease the morale—if I may use the term—of the labor employed. The employe's surroundings have a marked influence on his attitude toward his job. To work in or about an establishment which has an atmosphere of shiftlessness, unquestionably lowers the standards of the labor done. It is so easy for men to become shiftless in their habits, careless in their methods, and consequently less efficient in their work and of decreased value to themselves and to their employers.

finished in white—an innovation in buildings of this type. There was adverse criticism expressed—white shows dirt too readily; accumulated filth in the vicinity of white stands out too distinctly; white grows dingy more quickly than any other finish which might be selected. These were the important reasons given against the proposed use of white as a finishing color. Paradoxically these were the very reasons for selecting white; the interior walls were not to be allowed to become dirty, there were to be no accumulations of filth, and a dingy finish could be corrected by a coat or two of paint.

The buildings were but a part of the general scheme to improve the working conditions of the waste collection and disposal division. Other elements of the scheme were the installation of showers; the fitting up in the stable of a lounging room, where the employes might heat and eat their lunches in comfort; the setting aside of certain spaces of land for storage purposes, and the parking of the grounds.

After the buildings were finished, the first step taken in working out the scheme of plant and labor improvement was to arrange proper storage facilities for equipment when not in use, and for the various articles of potential value, such as wood, iron, etc., which are collected. These storage spaces were so arranged that, although necessarily somewhat unsightly, they are not conspicuous, but are easily accessible. Rules have been



PARKING SCHEME FOR SPOKANE CREMATORY GROUNDS.

The crematory plant of Spokane, Wash., is located accessibly, being approximately one mile from the centre of the city. It has no neighbors, situated as it is among railroad yards, but fortunately it has developed a sense of self-esteem.

It was with a desire for experimental application of certain theories of operation that the plans for the Spokane crematory plant and the associated group of buildings were developed. It was hoped that the plans could be so made and executed as to do away with the erroneous idea that a crematory plant must be unbeautiful and a constant insanitary nuisance. Therefore, a scheme for the promotion of cleanliness and beautification was evolved in conjunction with the plans drawn for the buildings. The plans called for substantial buildings, though severely plain, of good design. Red brick and concrete were used in construction. The finish was entirely in white. Gables, eves, window and door frames, as well as the interiors of all the buildings, were

promulgated covering the care of equipment and the proper storing of wastes. The observance of these rules has brought order out of a former chaotic state of affairs and has developed in the labor that desire for order and regularity which are the initial steps leading to efficiency.

The idea of combining a decorative scheme with the practical arrangements of the grounds was next suggested. The scheme of beautifying the grounds by planting shrubs was not frowned upon, but it did become a subject for our local jokesmiths. The public seem to find it difficult to associate anything well ordered or beautiful with a waste disposal plant. The City Commissioners, knowing the situation of the plant—bounded on one side by a dump and the Spokane river, and on the others by railroad yards—felt that it was an almost hopeless task to attempt to adorn and keep orderly the grounds and buildings, but their consent to the project was given gladly.

J. W. Duncan, superintendent of parks, developed a parking plan for the grounds. The scope of the plans

*Superintendent of Crematory Division, Department of Public Works, Spokane, Wash.

was somewhat limited, because of the peculiar aspect of the land and because of the excessive expense involved. The crematory group of buildings were erected on what was formerly the bed of an inlet of the Spokane river. The crematory building is situated directly on this bed. The balance of the buildings are located on made ground, the level of which has been raised about twelve feet above the floor level of the plant building. The soil at the plant consists of coarse gravel. The soil of the stable yards is the usual dump material of the average city. These soil conditions made it necessary to haul, a distance of three miles, all dirt required for planting purposes. The beds were prepared last spring and most of the shrubbery planted. Some of the later planting did not survive, but in general the plants have done well. The planting will be completed this spring. Quickly-growing shrubs, small trees and climbing vines, mostly roses, have been utilized. The dominant idea in arranging the plants has been to form screens. The vines have been so placed as to cover walls and the frame work of the approaches to the unloading floor of the crematory building, and to spread and cover the bare earth on the banks created by the difference in levels. The trees have been planted so as to break the monotony of bare walls where vines cannot be trained. The shrubs have been planted very thickly and will be thinned as they attain growth. It will require the passing of a few years for the parking to have reached its proper growth and development. This spring, to supply color to the landscape, flowers (annuals) will be planted.

We have found in a small way what an attempt at securing cleanliness, order and beauty means in the accomplishment of our day's work. Private enterprise has demonstrated beyond all question that it is good business properly to plan and carefully maintain its properties. We may see, scattered about the country, branch packing establishments, milling concerns and oil stations of the larger corporations that are examples of a new idea in plant construction and property maintenance. These institutions, beautiful in a simple and practical way, with their parking and yard features carefully planned and cared for, provide workshops which not only seize the interest and increase the value of their employes, but which also create among their patrons and the community at large that intangible but invaluable something called good will.

Would it not be good business for the American municipality to emulate the private corporations, whose well-ordered establishments stand as monumental object lessons for those who will but look? In the northwest there has been an awakening among the city authorities and a great deal of intelligent effort has been expended in the solution of this important problem of ground, building and labor betterment. A beginning has been made and an example furnished which it is hoped will lead to greatly improved conditions everywhere along these lines.

THE HETCH HETCHY RECORDS.

In regard to the following letter we regret that the statements made by our informant so distorted the facts, as explained by Mr. O'Shaughnessy. We are giving his letter as prompt and full publicity as possible.

Editor, Municipal Journal, New York City,

Dear Sir: In your issue of February 15, 1919, on page 137, there is a supposed record of decision by the Superior Court of San Francisco in connection with certain data desired by a group of people known as the San Francisco Bureau of Governmental Research.

The statements contained in your paragraph are untruthful and misleading in some respects. The Civic League of Improvement Clubs did not get behind this organization in its alleged fight. On the other hand, they made an investigation of records and data relating to the Hetch Hetchy project through a committee of five and made a favorable report as to the conduct and management of the project back to their organization. In the court proceedings the city's attorney made offer of display of all records which were public, in the pleadings presented in the case. The Judge's decision that such records must be made available is a profitless victory for the litigants. In the Judge's further ruling there was excepted from such records "all confidential reports, estimates or data collected or compiled by assistants or other engineers employed for the purpose for the use of the city attorney of the city and county of San Francisco or other attorney at law acting for said city and county in advising the defendants in respect to their official rights and action."

This decision in effect sustains the city engineer in his attitude for the protection of the city against various interests which have for years been endeavoring to obstruct the enterprises of the city of San Francisco and the Hetch Hetchy project in particular.

I regret that your correspondent should have distorted the information and findings above and hope the foregoing will put you straight on these matters.

Very truly yours,
M. M. O'SHAUGHNESSY,
City Engineer.

GUARANTEES FOR PAVING

Opinions of Several City Engineers as to Their Desirability—Duration of Guarantee—For What Kinds of Pavement Desirable.

The subject of guarantees for paving streets and highways was reported upon by a committee of the American Road Builders' Association last month and considerable interest was manifested in the subject. A few weeks ago, in sending out a questionnaire to the various cities concerning paving matters, Municipal Journal asked the number of years of guarantee that was required by each city on each of the several kinds of pavement, and also the two questions: "Do you consider guarantees desirable for each of the kinds of pavement named above? If not, for what kinds is it not desirable?" Something over 400 cities have answered the questionnaire up to this time, 246 of them replying to these two questions. Quite a number of the remaining cities reported that all of their paving was done by day labor and consequently the subject of guarantee did not interest them. Also, several reported the number of years' guarantee required for the different kinds of pavement but expressed no opinion as to the desirability of the practice.

It might be assumed, perhaps, that where guarantees were asked for, the city engineer was in favor of them. This does not follow necessarily, however, for in some cases the city ordinance requires guarantees, in others the requiring of guarantees has become established and no feeling against them has been aroused sufficiently strong to result in a discontinuance of the practice. Further evidence of this occasional condition is furnished by the fact that sixteen different city engineers whose cities require guarantees reported that they personally were not in favor of them.

In summarizing the opinions of the city engineers, we have divided them into three classes—those who did not believe in guarantees for any kind of pavement, those who believed in requiring guarantees for all kinds of pavement, and those who believed guarantees desirable for some kinds of pavement but not for others. The replies were further classified by states, and these states grouped by districts.

So classified and grouped, we find the following results as to the opinions held in the different sections of

the country: In New England four did not believe in any guarantee, one believed in guaranteeing all pavements and six in guaranteeing some pavements. In the Middle Atlantic states fourteen would guarantee no pavements, twenty-four all pavements, and fourteen some pavements. In the South Atlantic states, the figures were three for no pavements, six for all pavements and one for some pavements. In the Gulf states three for none, five for all and one for some. In the Central states there were twenty-four for none, thirty-five for all and nineteen for some. In the North Central states, eleven for none, eighteen for all and seventeen for some. In the Rocky Mountain states there were three for none, ten for all and two for some. In the Pacific Coast states, seventeen for none, one for all and one for some. Of six Canadian cities, two favor guarantees for none, three for all and one for some. Taking the total of the entire country, we find that 81 were opposed to guarantees for any kind of pavement, 103 would require guarantees for all kinds, and 62 for some kinds of pavements.

One rather striking feature of these figures is the slight difference between the proportions, in the different geographical sections, of those favoring guarantees for some or all kinds of pavements and those who do not favor guarantees at all. The last form 33 per cent of all of those reporting, and if we exclude the Pacific Coast states, we find approximately this percentage in each of the several sections of the country. The percentages of those not approving of any guarantee figure out as follows: New England states, 36½ per cent; Middle Atlantic, 27 per cent; South Atlantic, 30 per cent; Gulf, 33½ per cent; Central, 31 per cent; Northern Central 24 per cent; Rocky Mountain, 23 per cent; Pacific Coast, 89 per cent; Canada, 33 1-3 per cent.

It is possible that a few of those listed as favoring guarantees for all pavements would really except certain kinds, since a number of replies to the questions quoted above were confined to the word "yes." If about half of those so replying should be classed as favoring guarantees for some pavements only, we would have practically the same number in each of the three classifications.

REASONS FOR OPPOSING GUARANTEES.

Some of those who did not favor guarantees explained their opposition briefly, a few of these explanations being as follows: "If properly constructed, pavement will outlast guarantee and cost of guarantee be unnecessary." "Guarantees are never satisfactory." "Good contractors charge a liberal amount for repairs, and if this amount were used for inspectors a better pavement could be obtained." "First-class inspection is preferable." "Maintenance by the city is cheaper than paying for a guarantee." If we are not sure a pavement will last more than five years we do not want it, guarantee or no guarantee." "Rigid inspection is both cheaper and better." "Experience in enforcing guarantees shows that they do not amount to anything." "We cannot enforce guarantees." "With no guarantee and proper supervision we get lower prices and better work." "Not desirable, as a competent engineer, unhampered by politics, will insure good work." "Has always proved costly, and is uncalled for if the work is properly done." "No guarantee compensates for poor construction, and it adds greatly to the cost." Two or three are in favor of requiring guarantees only for untried, new materials or methods or proprietary pavements.

Those who favor guarantees for some kinds of pavements and not for others vary widely in their selections of kinds of pavements for guarantee. Some would require guarantee for brick, asphalt, wood block, etc., but not for bituminous or broken stone pavements, while others would require guarantees for the latter and not for the former. One city believes a guarantee especially necessary on bituminous pavements, another requires a guarantee on all except bituminous pavements. Possibly the greatest concensus of opinion is on the desirability of requiring no guarantee for gravel roads. Nearly as many would omit macadam from the list, while several would omit granite block, and next in order probably would come concrete. Apparently all of the cities that have used asphalt and favor guarantees at all, would require them for asphalt. In the case of brick, there are approximately the same number who would require guarantees for this pavement as those who would omit brick from the list of guaranteed pavements.

LENGTH OF GUARANTEE.

As to the length of guarantee, this varies from nine months to ten years. Only nine cities require a ten-year guarantee, and several of these require it for only one or two classes of pavement. Five require it for sheet asphalt, five for brick, three for concrete, two for bituminous concrete, and one for stone block. Five years is the most popular period, this being reported in 100 cases. One year was reported in 32 cases, two years in 13 cases and three years in 13 cases. Four are in favor of a one-year guarantee, although their cities are requiring guarantees for longer periods. One would require one year on bituminous pavements, macadam, gravel and concrete, and not more than two years on brick, stone and wood block and asphalt. Another would require one year on sheet asphalt and block pavements and five years on the other kinds. Another would require five years on asphalt pavements and concrete and no guarantee on other kinds. Another, five years for asphalt, brick, wood block, bituminous concrete and bitulithic, and one year for bituminous and water-bound macadam and concrete.

The above shows that the ideas of the several engineers as to the purposes of a guarantee differ widely. Those who would require a longer guarantee on pavements that are less durable probably do so with the idea that defects in those pavements are likely to occur at any time prior to their reaching a condition requiring renewal, while pavements like stone block or brick are more likely to reveal defects of workmanship during the first year of use. On the other hand, those who would put a five-year guarantee on brick or stone block and a one-year on bituminous macadam possibly assume that a reasonably good pavement of each kind should last for the period of the guarantee without showing any appreciable wear, and therefore the contractor should be willing to give such a guarantee without adding anything to the price of his bid. Others appear to argue that with reasonably careful inspection they can obtain a brick or stone block pavement that will last for five years and it is therefore unnecessary to call for a guarantee on such pavements; but that defective places are more difficult to avoid by inspection in the case of waterbound macadam or bituminous pavements, but are apt to appear during the first season or two, and that, therefore, guarantees are desirable in order that the contractor may be required to repair them. Possibly we misinterpret the reasonings which form the basis of the decisions of the several engineers as to requiring guarantees on the different classes of pavement, but the above suggest themselves to us as probable.

The report on this subject of the committee of the American Road Builders' Association was printed in full in last week's issue. A discussion of the matter of guarantees will be found on the editorial page of this issue.

Municipal Journal

Published weekly at
243 West 39th Street, New York, N. Y.
by
Municipal Journal and Engineer, Inc.

S. W. HUME, *President*
J. T. MORRIS, *Treasurer* A. PRESCOTT FOLWELL, *Secretary*

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Telephone (New York): Bryant 8601
Western Office: Monadnock Block, Chicago

Contributed Articles and Reports

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

ARE OUR CITIES CLEAN?

The catch-all alley that formerly could be found in so many cities, and was a disgrace to them, is rapidly disappearing. Instead of throwing ashes, rubbish and even garbage over their rear fences, householders are now required to place them in receptacles, to be removed by the city; and in many cities open fences are required between the alley and the abutting lots, so that sunlight can reach the former to dry and purify it, and so that collections of refuse there can not be hidden from the occupants of the neighboring houses.

But how about the city itself? Will the place to which it removes the collected refuse stand inspection? In too many cities the dumps, garbage disposal plants and other places where refuse is deposited are a nuisance, greater than were any of the alleys because on a larger scale. Of course no district with any "pull" will permit such a fly-and-stench-breeder and eye-sore within its limits, so it is located among ignorant foreigners who should be encouraged to cultivate American ideas of cleanliness instead of driven to even lower depths of physical and moral degradation. Or the refuse is hauled far beyond any settled part of the community, which additional hauling costs as much as all the rest of the collection service combined.

The buildings devoted to these and even to less unpleasant purposes, and the grounds around them, are generally given no attention or thought whatever that has for its purpose the mitigating of the forbidding aspect which they can too readily assume. Shapeless, unpainted, dirty buildings, surrounded by heaps of ashes and rubbish and pools of stagnant water, seem to be considered appropriate for refuse disposal and sewage treatment plants, and even for water works pumping stations and the stables and yards of the street department in some cities.

Under such conditions must labor every day citizens whom we are endeavoring to educate and train into sanitary ways. They are told that their yards and houses must be kept clean, but spend half of their waking hours in filthy surroundings maintained by the city itself, and are sent to their homes with clothing and persons grimy and greasy. Is it a wonder their homes are grimy and greasy too?

This is unnecessary and a disgrace. On another page of this issue is presented a contrasting picture. Spokane's garbage disposal plant is located among trees, shrubbery and flowers; the trim of the buildings is kept painted white so that dirt can not exist undetected; ashes and other bulky materials that must be stored are kept in neat piles screened by trees. The men must, even in such surroundings, become more or less dirty; but showers and dressing rooms are provided so that they can leave the plant for their homes with clean faces, hands and clothing and a feeling of self-respect that must have its effect not only in cleaner homes but in better morals and modes of living generally.

Such things cost a little more in dollars—so do clean streets, attractive residences, schools and other things that go to make up civilization. Who can say what the other things, the ugly, filthy, nauseous things that we permit and are disgraced by, cost us? The men we condemn to such surroundings are a part of us. At any time, through devious ways, their degradation may react upon the entire community. Until these spots are cleaned up, our cities will not be clean nor free from the debasing influence that they exert to some degree upon every one even remotely connected with them.

THE QUESTION OF GUARANTEES.

From replies of a large number of city engineers which are summarized elsewhere in this issue and from the discussion of the subject at the convention of the American Road Builders' Association, it is apparent that there is by no means a consensus of opinion as to either the principle on which the requiring of guarantees for pavement should be founded, or the desirability of requiring any guarantee at all. The committee of the association referred to apparently favors requiring a guarantee on every kind of pavement, but of the engineers whose opinions were obtained by Municipal Journal, only about one-third were of this opinion, about one-third would require guarantees on some classes of pavements but not on others, while the remaining third were not in favor of guarantees on any pavements.

If or when a guarantee is required, we believe that the basis set forth by the committee in its report is the proper one to use in determining the guarantee conditions; this being that the purpose of the guarantee is not to require the contractor to maintain the pavement, but rather to require repairs wherever the pavement was not constructed properly; the life of the guarantee being set at such duration that, if the pavement be well constructed, no repairing will be required during such period. If this theory could be embodied in a practical working guarantee, a contractor would be reasonably sure that, if the material and workmanship employed by him in constructing a given pavement were all that they should be, he would not be required to give any attention or incur any expense for the maintenance of the pavement after its construction had been completed.

This principle has the support of court decisions in many of the states, which decisions have been rendered in cases where the construction of the pavement is paid for in whole or in part by assessing abutting property, and the law requires the maintenance of the same pavement to be paid for out of the public funds. In this case, it is apparent that, if a guarantee requires a contractor to maintain a pavement during a longer period of years than a reasonably well-constructed pavement of this kind could be expected to give service without requiring any repairs, such a guarantee is one calling for maintenance in addition to faithful and adequate construction, and that therefore the charge which the contractor makes or should make for agreeing to repair the

pavement during its later years is a maintenance cost and not one of construction.

Aside from the legal reason just stated, there is perhaps no special reason why a city can not include with its construction bid a bid for maintaining the pavement for a series of years; the question is pertinent, however, whether maintenance so paid for would not be more expensive than if it were arranged for in some other way. In some cases there would be little question of this if the contractor bid intelligently, for unless he were sure that he would be doing work and have a plant in the city in question during the entire period of the contract, he would realize that the making of repairs at short intervals during the later years of the guarantee might prove very expensive to him.

It being generally admitted that it is desirable in most cases to provide a guarantee solely for the purpose of insuring that the materials and workmanship comply with the specifications, the question then arises whether this or some other method will best secure this end, everything being considered. There are at least two other factors that play a part in securing good work by contract, these being the inspection of the materials and workmanship by agents of the city or other "party of the first part," and the desire of the contractor to build up for himself a reputation for doing good work. Some contractors take no thought of their reputation, but the future career of such is sure to be precarious. Others may desire to secure such a reputation but are lacking in ability. There are fortunately an increasing number of contractors who have established and are continually adding to their reputation for taking a pride in their work and succeed in the great majority of cases in doing every job satisfactorily. It cannot be expected that such a contractor can be obtained on every contract at present, however, and it would appear therefore that reliance must be placed chiefly upon either a guarantee or inspection; and when the guarantee is omitted, inspection must form the chief reliance.

Inspection involves competent inspectors working honestly and faithfully in the interest of the city. Such men are none too numerous and demand good salaries. In some classes of pavement several such inspectors would be necessary, some at the plant where the materials are prepared and others on the street where the pavement is laid. The cost of thorough inspection would therefore be considerable. It is a question to be considered for each contract or class of contracts whether the cost of inspection would be greater or less than that of the guarantee. Also, whether politics or other influence will interfere with securing such rigid inspection.

In this connection it should be considered that the cost to the city of the guarantee frequently if not generally does not end with the sum added to the contractor's bid but, if it should be found necessary to collect from the contractor or his bondsmen, there will probably be legal costs which may amount to a considerable figure, with the added possibility that the case may be decided against the city. In fact, some cities are convinced from their experiences that, considering the shrewd lawyers that are retained by the bonding companies, the chances are largely against the city in any suit of this kind. Taking these things into consideration, many engineers and other city officials have come to the conclusion that adequate inspection, even though it may be expensive, is less so than collecting on guarantee bonds.

There is another consideration involving both law and justice to the contractor. The representative of the city prepares the specifications and dictates every detail of the construction of the pavement. The contractor must build the pavement exactly as the city directs and, having done this, is asked to guarantee the wearing qualities of the pavement. The pavement may prove defective through fault of the contractor, but on the other hand such defects may be due to faults in the city's plans; or they may be due to an increase in traffic which neither contractor nor city could foresee. It is in no sense the contractor's business to consider future traffic conditions however, since these should be provided for in the designing of the pavement, which is done by the city. Moreover, there are other conditions more or less under the control of the city and not at all under that of the contractor, such as the opening of the pavement for laying pipes or repairing the same.

It would seem, therefore, as though the city should assume responsibility not only for the plans but also for changed conditions which might render the plans inadequate, while the contractor is responsible only for the faithful carrying out of the specifications and plans. That, therefore, at least two-thirds or three-fourths of the responsibility for the durability of the pavement should rest with the city, and that it is an injustice to ask the contractor to assume all of the responsibility. It would seem that any contractor who does assume all of the responsibility is gambling on at least three-fourths of it, unless he is himself sufficiently informed in engineering matters to judge of the adequacy of the plans and specifications upon which he is asked to bid. Some have said that the contractor should have such knowledge and should pass judgment upon the city's specifications and, if they do not seem to him to be satisfactory, that he may then refuse to bid upon them. But it seems to us that a contractor cannot justly be assumed to have as much expert knowledge in this matter as an engineer, any more than an average engineer should be expected to make a successful contractor.

The chief argument in favor of guarantee seems to be that, under present conditions, inspectors in many cities are apt to be chosen for political reasons rather than for their ability to secure good work, or for other reasons are incompetent. We believe that this to a certain extent is true because their service is not looked upon as a very important one; but that if the officials realized and the inspectors were given to understand that faithful and competent service is as important on the part of the inspectors as of the engineer, if good pavements are to result, there would be little difficulty in securing a great improvement in the inspection service.

CREEK BANKS FROM INCINERATOR REFUSE.

The following letter was sent in reply to an inquiry addressed by us to J. F. Byxbee, Jr., city engineer of Palo Alto, Cal. About two years ago Municipal Journal published a brief note concerning this use of incinerator refuse by that city, and desired to learn how satisfactory it was proving with time:

Municipal Journal, New York City.

Gentlemen:

The city of Palo Alto, California, has operated an incinerator plant since 1912, and there is a residue from this plant consisting of ash, clinker, tin cans, broken crockery, glass, and old baling wire, amounting to about one large wagon load per day, weighing an average of 4,200 pounds.

We first attempted to dispose of this material by using it as a base on which to build gravel or macadam roads, but this did not prove a success except in minor instances, due to the limited supply.

Our next idea for deriving value from this product was to use it for reclaiming ground along the banks of a creek which flows along one of the boundaries of the city for about two miles. This creek has an average cross-section

about 60 feet wide at the top and 20 feet wide at the bottom and from 20 to 25 feet deep. In summer it is dry, but in winter it runs as much as two-thirds full for short periods. The banks are composed of gravel, clay and fine silt and naturally the erosion is very great during flood periods. There are places where as much as a quarter of an acre of soil to a depth of 20 feet has been removed in a season.

In filling these washes with the refuse from the incinerator, we dress the slope to an angle of about one to one and thoroughly wet down the mixture of ash, tin, clinker, etc., to produce a compact fill. When the fill is completed, we cover it with a thin skin of earth and manure to hide its unsightliness and to induce the growth of grass and shrubs. By this procedure the creek bank is returned to its original location and in several years the growth on the fill becomes rank enough to take on the appearance of the undisturbed banks immediately adjacent.

Since starting this work we have filled two large and important areas and are now proceeding on a third.

The material resists erosion very well and becomes more thoroughly set in place as it ages. Our confidence in its ability to hold the stream in line has increased greatly, and it is the only inexpensive construction we have tried thus far which has withstood the floods. Of course, I do not wish to imply that this material will permanently resist the erosive action of these flood waters, but from observations covering three years we feel that we are disposing of the material from the incinerator to advantage in this way.

Very truly yours,
J. F. BYXBEE, Jr.,
City Engineer.

LABOR CONDITIONS IN THE UNITED STATES

Information and Opinions Collected from State Highway Departments, Cities, Contractors, and the Department of Labor—Emigration of Laborers.

A committee on "Sources of Supply of Unskilled Labor for Highway Work," of which the chairman was Paul D. Sargent, chief engineer of the Maine State Highway Commission, presented a report to the convention of the American Road Builders' Association that embodied figures and opinions from federal, state and city officials and contractors on this subject, from which it drew the following conclusions:

"From the reports furnished by state highway departments and contractors, suplemented by the positive statements by officials of the War Labor Policies Board, and pending legislation to prevent a period of unemployment, your committee is forced to the conclusion that there will be a sufficient supply of unskilled labor for highway projects during the coming season and at wages slightly less than those prevailing during the season of 1918."

It made efforts to learn the condition of the unskilled labor market for the years immediately succeeding the close of the civil war, but was able to learn little or nothing from any records that could be found at Washington. Concerning present conditions it reported as follows:

SURVEY OF LABOR CONDITIONS.

A questionnaire was sent out to all state highway departments, to the city engineers of all cities having a population in excess of one hundred thousand, and to many of the large road-building contractors throughout the country. Replies to this questionnaire have been received from thirty-nine of the forty-eight state highway departments, from fifty-four of the eighty-two cities to which it was sent, and from twenty-four road contractors.

The questionnaire asked for information as to the number of hours for a day's work, the rate of pay per hour for common labor from 1912 to 1918 and asked what would be the probable rate for common labor for 1919, 1920 and 1921. Inquiry was also made as to the apparent available sources of supply of common labor for the present season. Suggestions were asked as to additional sources of supply if there did not appear to be a sufficient supply in sight. We also asked if state labor exchanges had been used where established and with what result, and concluded the questionnaire by asking for information as to the number of common laborers required for construction work during the season of 1919.

From the replies to our questionnaire, which have been tabulated, we extract the following information:

Replies from State Highway Departments: Thirty-nine state highway departments made replies to our questionnaire. As some of the departments are only two years old we have not used their replies in figuring average rates of wages.

In 1912 the average rate per hour as reported by twenty-seven states was $.188, while in the same year Georgia was paying $.09 and Nevada was paying $.40. Only six states were paying $.25 or more and ten states were paying $.15 or less—the most of them less. In 1913 the average as reported by twenty-eight states was $.20. In 1914 the same states reported an average of $.205, in 1915 of $.225, in 1916 of $.2585, in 1917 of $.303, and in 1918 of $.39. The highest rate for 1918 is reported by Oregon and is $.58. The lowest is by South Carolina and is $.18 per hour.

Twenty-seven states replied to our question as to probable wage per hour in 1919. The average of these replies gives a rate per hour of $.352, which, compared with the average of $.39 for 1918, shows a slight decline. Fifteen states think the rate for 1921 will be slightly less than in 1920. The other states do not venture a guess.

Thirty states think labor supply will be more plentiful in 1919, 1920 and 1921 than during the past three years. Twenty of these states give as their reason the ending of the war, with return of soldiers, closing of war industries, munitions plants, stopping of shipbuilding, etc. West Virginia thinks prohibition will put a great many men at work who never worked before. Several states report an over supply of labor now.

Suggestions for additional sources of supply of common labor are as follows: Seven states suggest use of convicts; five suggest importing Chinese, and five suggest Mexicans; five suggest general or restricted immigration from Europe. Seven states report sufficient or too much labor now.

Fourteen states have state labor exchanges. Five states have secured labor through these exchanges, but only three report good results. Other reports are as follows: "Not good for common labor;" "Not very good;" "Indifferent;" "Got some labor;" "No good."

Twenty-eight states estimate their requirements of common labor for 1919 as 160,900 men.

Replies from Cities: Fifty-four out of eighty-two cities have replied to our questionnaire. Forty-six furnish information as to wages for all years from 1912 to 1918. Taking the year 1912, Spokane, Washington, reports $.37½ per hour, which was the highest, and Birmingham, Alabama, with $.14 was the lowest, while the average rate for the year was $.234. In 1913 these forty-six cities report an average wage of $.238 per hour. In 1914 the average was $.245; in 1915, $.255; in 1916, $.276; in 1917, $.312; in 1918, $.384. Boston, Massachusetts, reports the highest rate for 1918. It is $.52½ per hour. San Antonio, Texas, had the lowest for the year, $.25, while Atlanta, Georgia, and New Haven, Connecticut, both report a wage of $.28.

The average wage which forty-eight cities expect to pay in 1919 is $.384, which is the same as the average for 1918.

(To be continued)

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading ones published in other countries, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on muncipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

ROADS AND PAVEMENTS.

Paving Outlook:

Paving Outlook for 1919. Reports by paving officials in all sections of the country, giving their opinions on the subject as formed during the past two weeks; effect of war on 1918 paving and present prices. 7,700 words. Municipal Journal, Feb. 22. 10 cts.

Statistics from Cities. From information received from city engineers of about 300 cities as to amount of each kind of pavement that should be constructed, resurfaced or repaired in their respective cities this year. 700 words. Municipal Journal, Feb. 22. 10 cts. (To be continued.)

$25,000,000 Federal Aid for Highways? So Says Unofficial Report from Ottawa. 800 words. Canadian Engineer, Feb. 6. 15 cts.

British Program for Road and Bridge Work. Text of circular sent by secretary of the Road Board to local authorities outlining plans for 1919-20. 1,500 words. Good Roads, Feb. 8. 10 cts.

Colorado to Build Roads. Bond issue of $20,000,000 for future work and expenditure of nearly $1,500,000 in 1919 included in state program for highway work. 2 ills., 800 words. Good Roads, Feb. 15. 10 cts.

The Manufacturers' and the Contractors' Point of View. Manufacturers of paving material shares the belief of all engaged in highway and street improvement that an unprecedented era of construction is before the country. By M. B. Greenough, ass't secy. National Paving Brick Manufacturers' Ass'n. 800 words. Municipal Journal, Feb. 22. 10 cts.

An Enlarged Plan for Road Work in Virginia. Part of an address at the meeting of the Virginia Good Roads Ass'n by G. P. Colaman, state highway commissioner, dealing with future plans for the development of Virginia's highway system. 2,000 words. Good Roads, Feb. 1. 10 cts.

To Pave or Not to Pave? Editorial on the urgent need of paving improvements throughout the country and the advisability of starting work promptly. 1,500 words. Municipal Journal, Feb. 22. 10 cts.

Construction Methods:

Method Employed in Minneapolis in Constructing Smooth Surfaced Concrete Base for Wood Block Paving. Difficulty of getting smooth base; use of templates and roller. By Ellis R. Dutton, ass't city engr., Minneapolis. 2 ills., 600 words. Municipal and County Engineering. February. 25 cts.

Wood Block Pavements at Lakewood, O. Method employed in laying block on pitch cushion; joints filled with pitch to one-third their depth. By E. A. Fisher, city engineer, Lakewood, O. 1 ill., 1,300 words. Municipal Journal, Feb. 22. 10 cts.

Pavement Foundations. Editorial on the necessity of adapting thickness of pavement base to load to be carried or to nature of soil. 400 words. Municipal Journal, Feb. 1. 10 cts.

Road Building Materials Supply Solved by System. Wisconsin county eliminates delays and demurrage; contractors selected for past record; cost-plus-profit contract. By W. J. Driscoll, ass't commissioner of highways, Outagamie county, Wisconsin. 2 ills., 2,200 words. Engineering News-Record, Feb. 6. 20 cts.

Machine for Removing Sheet Asphalt Pavement from Between Street Car Tracks. Self-loading outfit for tearing up asphalt pavement between tracks. 1 ill., 200 words. Engineering and Contracting, Feb. 19. 15 cts.

Base Construction on Steep Grade. Method of placing concrete by means of chute laid down hill on a 26 per cent. grade. 1 ill., 100 words. Municipal Journal, Feb. 8. 10 cts.

Paving Finances:

Assessments for Street Improvements. Various classes of improvements and services for which different cities assess the cost, the cities that make assessments for each, and the percentages of cost assessed. 1 table (2 pages), 1,300 words. Municipal Journal, Feb. 22. 10 cts.

Assessing Paving Costs. Editorial discussion of what would be the most fair and just practice to all concerned. 600 words. Municipal Journal, Feb. 22. 10 cts.

Cost of Highway Maintenance in Washington. A state-regulated, county-administered system of maintenance has been operated since June, 1917; first year's expenditure for maintenance, repairs and equipment totaled $340,188.63 on primary highways. 600 words. Municipal Journal, Feb. 8. 10 cts.

Federal Aid for Highways. Hon. Dr. Reid makes announcement at Eastern Good Roads Ass'n meeting; "first-class roads" will receive "fair and reasonable aid;" all the money provinces can spend. 1,500 words. Canadian Engineer, Feb. 13. 15 cts.

City Streets:

Improving Hillside Streets. Two-level streets, switchbacks and sunken roadways used on San Francisco streets in mounting steep hill sides. 4 ills., 700 words. Municipal Journal, Feb. 22. 10 cts.

Steps Up San Francisco Sidewalks. Built of wood; pedestrians can use either steps or smooth walk. 1 ill., 100 words. Municipal Journal, Feb. 8. 10 cts.

Roads of New York. Historical sketch of the development of the New York State Highway Department, with a review of its organizations and accomplishments. By E. A. Bonney, supervising engr., N. Y. State Dept. of Highways. 11 ills., 4,000 words. Good Roads, Feb. 22. 10 cts.

Street Work in Manhattan. Historical and descriptive sketch of the development of highway operations in the borough originally known as New York City. 3 ills., 2,100 words. Good Roads, Feb. 22. 10 cts.

Highway Work in Four New York Boroughs. A brief resume of the outstanding features of road and street work in the boroughs of Brooklyn, The Bronx, Queens and Richmond. 7 ills., 3,200 words. Good Roads, Feb. 22. 10 cts.

Miscellaneous:

The Brick Highways of Ashtabula County, Ohio. The Dorset brick road a model; 40 miles of brick highway constructed in county since 1916, 62 since 1913. By Ray N. Case, co. engr., Jefferson, O. 17 ills., 2,000 words. Municipal and County Engineering, February. 25 cts.

Bitoslag Pavement in Luzerne County, Pa. Notes descriptive of this special construction laid under the supervision of the state highway department. By J. C. Rock, Eastern Paving Co. 2 ills., 1,200 words. Good Roads, Feb. 1. 10 cts.

Make Good on Pavement Construction to Avoid Necessity of Making Excuses for Failure. Attitude of average citizen; cheap pavements please taxpayers only temporarily. By F. A. Churchill, Conneaut, O. 1,100 words. Municipal and County Engineering, February. 25 cts.

City Pavements for State Highways in Connecticut. The Burnside avenue pavement in East Hartford. By Chas. J. Bennett, state highway comr., Hartford, Conn. 800 words. Municipal and County Engineering, February. 25 cts.

Lesson Taught by Road Building Experience in Florida. Quality sacrificed to quantity; licensed engineers; old and new style specifications. By G. R. Ramsey, assoc. mem. Am. Soc. C. E. 1,700 words. Municipal and County Engineering, February. 25 cts.

Effects of Heavy Traffic. Weight of heavily loaded trucks using the main and residence streets in several hundred cities, and damage resulting from such use; increased thickness of base adopted or recommended. 1 table (5½ pages), 1,300 words. Municipal Journal, Feb. 22. 10 cts.

Rochester's Sewer and Paving Specifications. New specifications for pavement, sidewalk and sewer construction adopted by the engineering department for after-the-war work. By James W. Routh, chief engineer Bureau of Municipal Research, Rochester. 2 tables, 2,000 words. Municipal Journal, Feb. 1. 10 cts.

The Construction and Maintenance of the State Trunk Highway System of Wisconsin. Devote less state funds to construction and more to maintenance. By A. R. Hirst, state highway engineer of Wisconsin. 2 ills., 4,500 words. Good Roads, Feb. 8. 10 cts.

Laying Out Wisconsin's Trunk Highways. Discussion of the methods of establishing the Wisconsin trunk highway system, and lessons learned in doing it; total cost to state about $20,000, or $4 per mile. By A. R. Hirst, state highway engineer of Wisconsin. 2,000 words. Good Roads, Feb. 1. 10 cts.

Provisions of Proposed Indiana Highway Law. Summary of the text of a bill introduced in the Indiana senate providing for the establishment of a state highway commission, a state system of highways, and a state highway fund. 2,500 words. Good Roads, Feb. 15. 10 cts.

The American Road Builders' Association. History, aims and officers of the national organization which meets in its 16th annual convention in New York next week. 29 ills., 3,700 words. Good Roads, Feb. 22. 10 cts.

Steam Heated Bitumen Extractor. Made at slight expense and gave satisfactory results in making analyses of asphalt pavement samples, even in cold weather. By C. H. Lovejoy. 1 ill., 300 words. Municipal Journal, Feb. 15. 10 cts.

SEWERAGE AND SANITATION.

Sewerage Designing:

The Selection of the Value of the Factor "n" in Sewer Design. Definite value not justifiable; determined by construction conditions. By Paul E. Green, member of A. S. C. E. 1,100 words. Municipal and County Engineering, February. 25 cts.

Storm Sewer Extensions at Toronto Harbor. Drainage problems arising from waterfront improvements and how they are being solved. By Geo. T. Clark, designing engr., Toronto Harbor Commission. 4 ills., 2,000 words. Canadian Engineer, Feb. 6. 15 cts.

Sewer Construction:

Some Design and Constructional Features of the Rideau River Intercepting Sewer, Ottawa, Can. Equipment used and cost of labor material and labor; work done by day labor. By L. McLaren Hunter, city engrg. dept., Ottawa. 4 ills., 1,700 words. Municipal and County Engineering, February. 25 cts.

Two Sewer Construction Plants. Portable concrete mixing plant for constructing concrete sewer running parallel and close to a double line of street railway tracks; stationery concrete mixing plant for building 8-foot reinforced concrete sewer. 4 ills., 500 words. Municipal Journal, Feb. 1. 10 cts.

Sewage Treatment:

Sewage Disposal Works in Reconstruction Period. Including three tables of

construction costs, interest, maintenance and operating costs and net city expenditures per capita in 1915. By H. P. Eddy, consulting engr., Boston, Mass. 1,500 words. Municipal and County Engineering. February. 25 cts.

Sewage Treatment in New York. Editorial comment on the use of sub-surface plants, one of which is described in this issue. 300 words. Municipal Journal. Feb. 15. 10 cts.

Sewage Screening Plant in New York City. Completion of the first unit of the general plant of the Metropolitan sewage commission; grit chambers, screens, apparatus for handling screenings and other details of Dyckman street plant. 3 ills., 2,600 words. Municipal Journal, Feb. 15. 10 cts.

Daytona Sewerage Conditions. Studies of sewage screens by Florida State Board of Health; dilution ample; chlorine removes 80 per cent of bacteria; fine screens in use. 8 tables, 1,500 words. Fire and Water Engineering, Feb. 5. 15 cts.

Loss of Head in Sewage Sludge Pipe at Toronto, Ontario. Experiments made on 12-inch cast-iron sludge main after five years of use give value of n = 0.0168 to 0.0181. By T. H. Nevitt, supt. of sewage works, Toronto. 1,100 words. Engineering News-Record, Feb. 6. 20 cts.

Sewage Disposal at Manchester. Activated sludge investigations; results of operation at Withington and Davyhulme works; new unit for research. 2,300 words. Canadian Engineer, Feb. 13. 15 cts.

Sanitation:

Rural Sanitation. Of all branches of municipal government, no department receives less consideration than that of health; matters outlined which would be of material benefit. By Thos. Watson, chief provincial sanitary inspector, Saskatchewan. 3,700 words. Western Municipal News, February. 10 cts.

Sanitation in Emergency Shipyards. Safeguarding against influenza; collection and disposal of wastes; fly and mosquito extermination; water supply. 3 ills., 2,000 words. Municipal and County Engineering, February. 25 cts.

Miscellaneous:

A Critical Study of the Bacterial Count in Water and Sewage. Table of comparison of the characteristics of error series in bacteriological tests with those of common statistics and mathematical series. By M. F. Stein, designing engr., Div. of San. Engrg., Cleveland, O. 2 charts, 1 table, 3,200 words. Engineering and Contracting Feb. 12. 15 cts.

Soil and Drainage Pipes for Buildings. Investigation recently made by Wm. Paul Gerhard, C. E., of New York, to determine the comparative value of different kinds of material for drainage, soil and vent pipes for buildings. 2 ills., 2,800 words. Engineering World, Feb. 1. 15 cts.

San Francisco's Sewage System. Includes a reinforced concrete pumping plant recently completed; city is divided into two main drainage districts. By W. A. Scott. 4 ills., 2,200 words. Engineering World, Feb. 1. 15 cts.

Auto Catch-Basin Cleaning Truck. Cambridge, Mass., has constructed such a machine for cleaning out and removing the material from its street catch-basins; in service six months; excavating and loading done by means of an orange-peel excavating bucket. 1 ill., 400 words. Canadian Engineer, Feb. 6. 15 cts.

WATER SUPPLY.

Water Works Systems:

The Waterworks and Sewerage of Buenos Aires, Argentina. Past and present waterworks and sewer system; reinforced concrete sewer built on slipway and launched. By Allan B. Lea. 5 ills., 1,700 words. Engineering and Contracting. Feb. 12. 15 cts.

The Kansas City Waterworks. Many extensive improvements and extensions planned for the coming year by the water department; at least $2,000,000 needed for projected filters and other extensions. 4 ills., 1,000 words. Fire and Water Engineering. Feb. 12. 15 cts.

Water Supply of San Francisco. Describing the proposed Hetch Hetchy water supply plan which is now in progress of construction and which will cost in the neighborhood of $45,000,000. 600 words. Fire and Water Engineering, Feb. 5. 15 cts.

Waterworks Operation:

Waterworks Operation — Reservoir Maintenance. Drawing off foul bottom water; removing vegetation from exposed bottom; preventing and destroying algae. 2,600 words. Municipal Journal, Feb. 1. 10 cts.

Waterworks Operation: Reservoir Maintenance. Collection of sediment in reservoirs and methods of removing it; flushing out, pumping, wheelbarrows and wagons, and dredges. 1 ill., 2,500 words. Municipal Journal, Feb. 8. 10 cts.

Office Records of the St. Louis Water Division, Distribution Section. For distribution purposes, the city is divided into six districts, each having a station building with a station foreman in charge. From the December Journal of American Waterworks. 2,600 words. Canadian Engineer, Jan. 30. 15 cts.

Making Water Analyses. Reason why analyses are desirable; chemical, bacteriological and physical; private or municipal laboratories; suggestions for taking samples and analyzing. 2,500 words. Municipal Journal, Feb. 15. 10 cts.

A Syphon Reservoir Blow-Off. For wasting bottom water from Rio Grande reservoir, canal zone; bottom water rendered foul by organic matter; analyses showing improvement resulting from use of syphon. By Geo. C. Bunker, in charge of Canal Zone water purification and laboratories of Municipal Engineering Division. 1 ill., 1,300 words. Municipal Journal, Feb. 1. 10 cts.

Rainfall Records. Some practical uses that this important data can be put to; remarkable variation records in nearby sections; numerous rain gauges in various portions of the country should be established. By L. M. Hastings, city engr., Cambridge, Mass. 2,000 words. Fire and Water Engineering, Feb. 19. 15 cts.

Pumping:

Economic Value of Electrically Driven Pumps for Small Waterworks. Advantages of electric motive power; surface pumping. By D. D. Ewing, prof. of electric railway engineering, Purdue University, Lafayette, Ind. 2,500 words. Municipal and County Engineering, February. 25 cts.

Electrically Driven Pumps in Small Waterworks. Advantages of electric motive power for driving pumps; power requirements; cost of changing to electrically driven pumps. By D. D. Ewing, prof. of electrical railway engrg., Purdue University. 1,700 words. Engineering and Contracting, Feb. 12. 15 cts.

Lynn Water Commissioner. Reeves J. Newsome, elected by city council, describes two new pump installations made for his department; head cut from 45-foot to 27-foot, with a saving of $8,000 for year's pumping. 1 ill., 1,000 words. Fire and Water Engineering, Feb. 19. 15 cts.

Metering:

Financial Benefits of Metering. Interesting information of benefits both to the consumer and the city given in the last annual report by Geo. H. Fenkell, gen. mgr. of the Board of Water Comrs., Detroit, Mich. 1,300 words. Engineering and Contracting, Feb. 12. 15 cts.

Selection for Service Meters. Controlling principles involved in determining size and make should be economy and efficiency; oversizing a common fault. By W. R. Edwards, assistant supt., Passaic, N. J., Water Co. 1,100 words. Engineering and Contracting, February 12. 15 cts.

Measuring and Recording Deliveries of Irrigation Water to Farms. Abstract of an article by J. S. Longwell, ass't engr., U. S. Reclamation Service, on the importance of these measurements to the water users and project interests, together with a discussion by D. C. Henny, consulting engr., U. S. Reclamation Service. 2,000 words. Engineering and Contracting, February 12. 15 cts.

Purification:

The Chlorination of Water Supplies. Chicago's famous Bubbly Creek water filtration process on a large scale in this country. By Wm. J. Orchard, Wallace & Tiernan Co., N. Y. 2 ills., 1,600 words. Engineering World, February 1. 15 cts.

Features of Present-Day Water Purification Practice. A non-technical review written for municipal officials. By Milton F. Stein, civ. engr., Chicago. 4 ills., 4,000 words. Municipal and County Engineering, February. 25 cts.

St. Louis Water Purification Plant. Excerpts from report of chief chemist August V. Graf, for 1918; interesting details of the operation of the plant; river water highly colored and turbid; water said to be safe to consumers. 1 table, 1,600 words. Fire and Water Engineering, February 5. 15 cts.

Removal of Iron and Manganese from Water Supply of Wausau, Wis. Removal by aeration and filtration recommended by W. G. Kirchoffer, consulting engr., Madison, Wis., in a report submitted last December. 1,000 words. Engineering and Contracting, February 12. 15 cts.

The Chloramine Process. A description of its application to the Catskill (Esopus) water of New York City's water supply; what the process consists of. By Frank E. Hale, Ph. D., dir. of laboratories, dept. water supply, gas and electricity, N. Y. C. 3 ills., 3 tables, 2,500 words. Fire and Water Engineering, February 26. 15 cts.

Miscellaneous:

Reinforced Concrete Pressure Pipe. Concrete properly made and sufficiently reinforced will resist safely stresses up to 100 pounds to square inch; new type of joint illustrated; method of manufacture of the pipe. By Coleman Meriwether, from a paper read before the Illinois section of the American Waterworks Ass'n. 2 ills., 1,800 words. Fire and Water Engineering, February 12. 15 cts.

Liner Plates for Hydraulic Tunnel. Steel liner plates, which eliminate the necessity for tunneling shield; tunneling can be made continuous on account of maximum amount of clearance obtainable; unnecessary for gangs to wait for each other. By Frank C. Perkins. 2 ills., 400 words. Fire and Water Engineering, February 5. 15 cts.

Successful Operation of the State Water Code of Oregon. Shows a saving in time and water to irrigator; function of state water board, state engineer and water master. By Percy A. Cupper, state engr., Salem, Ore. 2,100 words. Engineering News-Record, February 27. 20 cts.

Shooting Water Wells with Nitro-Glycerin. Nitro-glycerin put to a novel yet practical use at Twin Bridges, Del., when 150 qts. were exploded in a drilled water well. By Thos. M. Knight. 1 ill. 500 words. Engineering and Contracting, February 12. 15 cts.

A 4,000,000-Gallon Reservoir. Description and illustration of the construction of a reinforced reservoir and coagulation plant at St. Louis for the Anheuser-Busch brewery. 1 ill., 1,600 words. Engineering World, February 1. 15 cts.

Saving Effected by Detroit Water Board by Using Excavating and Pipe Laying Machinery. 3 ills., 300 words. Engineering and Contracting, February 12. 15 cts.

STREET LIGHTING AND POWER PLANTS.

Water Power Development:

Development of Hydroelectric Resources in Eastern United States. Deterring influences and development are outlined; brief review of what has already been accomplished; urgent need and benefits of hydroelectric developments. By D. H. Colcord, Westinghouse Electric & Manufacturing Co. 4 ills., 3,000 words. Electrical Review, February 8. 30 cts.

Development of Massachusetts Water Power. Special commission appointed to investigate the facilities and possibilities in this direction urges action; public ownership is declared to be of doubtful value as a water-power policy. 1 ill., 2,000 words. Electrical World, February 8. 15 cts.

Water Power Administration in Canada. Summary of 14 articles of existing laws, regulations and practices in common to each of the four Canadian jurisdictions, Quebec, Ontario, Prairie provinces and territories, and British Columbia. By H. W. Grunsky, B. A., B. C. L. 3,000 words. Canadian Engineer, February 13. 15 cts.

2,305,310 H. P. Developed from Water in Canada. That is the installed capacity of Canadian hydroelectric plants according to census just completed by Ottawa authorities; installation of additional units in present plants would add 530,000 H. P.; Queenstown and other developments under way not included. 1,400 words. Canadian Engineer, January 30. 15 cts.

Power Plants:

Power Development at Drummondville, P. Q. Southern Canada Power Co. is building concrete dam, 1,700 ft. long, extending diagonally into St. Francis river, and new power house with capacity of 18,000 h. p.; 3,500 h. p. vertical units, 32 ft. head. 7 ills., 1,500 words. Canadian Engineer, January 30. 15 cts.

Simplicity Marks Michigan's Largest Hydroelectric Development. Simplicity of layout, co-ordination of turbines installed to water flow and 140,000-volt transmission line, mark development at Junction dam. 6 ills., 2,200 words. Electrical Review, February 1. 30 cts.

Central Electric Power Station Statistics. Analysis of data gathered by Dominion water power branch and bureau of statistics; primary power, kinds and how distributed; review of commercial and municipal stations; capital invested, salaries and wages. 10 tables. 1,200 words. Canadian Engineer, February 6. 15 cts.

Use of Electricity:

Heating by Electricity. Presentation of principles of heating residences, which prove the impracticability of ever employing this agency in general practice. 800 words. Municipal Journal, February 8. 10 cts.

Association of Electrical Inspectors Discusses Post-War Problems. 14th annual meeting considers timely inspection problems; conservation through standardization of electrical devices; legal status of electrical rules; combined fire and safety code. 3 ills., 7,500 words. Electrical Review, February 1. 30 cts.

Gas:

The Place of Research in the Gas Industry. Little progress in last hundred years in the zone of potential variations; universal carbonization; gas as secondary product; possibilities of hydrogenation and sulphur. From paper by S. W. Carr, prof. of applied chemistry, University of Ill. 2,500 words, Gas Age, February 1. 20 cts.

Operation of Buenos Aires Gas Plant. South American gas works affected by the shortage of coal. 1 ill., 800 words. Gas Age, February 1. 20 cts.

Ammonia Plant at the Stockholm Gas Works. Description of a modern ammonia and ammonium sulphate plant of latest Swedish design. 5 ills., 1,600 words. Gas Age, February 1. 20 cts.

Miscellaneous:

Photographic Study of Porcelain Insulators. Polarized light employed in examination of thin sections of insulators some of which had been properly fired while others were underfired and still others overfired. By Harold G. Tufty, research dept., University of Wisconsin. 3 ills., 3,000 words. Electrical World, February 8. 15 cts.

Liability of Central-Station Company for Failure of Electric Power. Several decisions covering the question of power failure, both through negligence of employes of utility company and through breach of contract. By Chesla C. Sherlock. 1,400 words. Electrical Review, February 8. 30 cts.

FIRE DEPARTMENT.

Drills and Training. Importance of the education of members of fire departments in the details of their profession; necessity for and forms of drills; the problem of fire education in small cities and towns. By J. R. Young, insurance comr. of North Carolina. 1 ill., 1,800 words. Fire and Water Engineering, February 26. 15 cts.

The Flying Squadron System. An innovation which has been found particularly valuable where two-platoon systems have been installed without appreciable increase in personnel; Detroit the pioneer in its adoption. By Chas. E. Meek, New York, asst. member I. A. F. E. 1,300 words. Fire and Water Engineering, February 12. 15 cts.

The Oklahoma Bill. Measure introduced in Legislature for state-wide two-platoons. 800 words. Fireman's Herald, February 1. 10 cts.

Oil Fuel for Steam Fire Engines. Advantages claimed for crude oil as fuel over coal; great improvements in methods of using the liquid fuel; circular gravity feed burner. By Chief Wm. C. Kerholtz, fire department, Fresno, Cal. 1,000 words. Fire and Water Engineering, February 5. 15 cts.

Central Fire-Alarm Station of San Francisco. Unusually complete equipment and many unique features to guard against fire hazard; special provision to insure reliability of power supply and interchangeability of circuits; method of operating. 7 ills., 3,300 words. Electrical Review, February 22. 10 cts.

Protecting Fire Hydrants Against Freezing in Winnipeg. Despite severe climatic conditions the firemen have never found a hydrant out of commission when required; due primarily to a system of daily inspection in congested areas, bi-weekly and tri-weekly in other portions of the city. 600 words. Engineering and Contracting, February 12. 15 cts.

Fire Prevention in the Factory. Importance of daily and weekly inspection; fire pails should be easily seen and accessible; automatic shut-off valves for oil system; private fire alarms and departments. By Geo. H. Greenfield, member N. F. P. A. 6 ills., 3,500 words. Fire and Water Engineering, February 19. 15 cts.

Clean-Up and Paint-Up Campaigns. They help to reduce the fire hazard; in Cincinnati fire loss cut down $900,000 in a single year; many other cities adopt plan. 1 ill., 700 words. Fire and Water Engineering, February 26. 15 cts.

TRAFFIC AND TRANSPORTATION.

Traffic Regulations and Their Value. A discussion of the function and results of traffic regulations, with a review of the work of standardization undertaken by the Highways Transport Committee. By Wm. P. Eno, chairman. 1,500 words. Good Roads, February 22. 10 cts.

Regulation of the Speed, Weight, Width and Height of Motor Trucks and Trailers. Abstract of paper presented at the meeting of the American Ass'n of State Highway Officials, by George Graham, chairman, Motor Truck Committee, Nat. Automobile Chamber of Commerce. 2,300 words. Canadian Engineer, February 6. 15 cts.

Work of the Highways Transport Committee. Authorized statement by the Council of National Defense on the post-war program of its transportation committee. 1,100 words. Good Roads, February 1. 10 cts.

Motor Truck Costs Much Higher Than Generally Assumed. Data collected by Motor Truck Ass'n show high average operation expense; new cost system to be recommended. 800 words. Engineering News-Record, February 27. 20 cts.

Bridgeport Well Pleased with Safety Cars. Pioneer safety-car service in East was inaugurated on February 2 on nine-car line through business section of city; special precautions taken to safeguard initial service to insure freedom from interruption. 6 ills., 3,000 words. Electric Railway Journal, February 8. 15 cts.

Application No. 3808. History of San Diego electric railway told in this request for relief made to California railroad commission proves that rectitude affords no guarantee that income will exceed outgo. 1 ill., 7,000 words. Electric Railway Journal, February 8. 15 cts.

STREET CLEANING AND REFUSE DISPOSAL.

Street Cleaning Methods. Sweeping by machine and hand, flushing and sprinkling, and other street cleaning operations discussed in report of Rochester Bureau of Municipal Research; patrol routes; equipment and its use. 5 ills., 3,800 words. Municipal Journal, February 8. 10 cts.

Street Cleaning Methods. Machine sweeping; where and when used to advantage; construction of sweeper; operation in batteries; cost. 3 ills., 1,700 words. Municipal Journal, February 15. 10 cts.

Refuse Disposal in Winnetka. New plan inaugurated in 1917, using municipally owned equipment specially designed for the purpose, and operated by collectors reporting directly to the village office. 200 words. Municipal Journal, February 1. 10 cts.

Baltimore Garbage Will Be Made Into Pork. Contractor will pay city three and a half time as much per ton as Chicago top price for market hogs, thus eliminating gambling risk to both parties; change from disposal by reduction. By Walter E. Lee, water engr. of Baltimore. 2,100 words. Engineering News-Record, February 6. 20 cts.

Snow Rolling in Laconia. Description of snow roller used in Laconia, N. H., for several years. From information furnished by the city engineer, Chas. A. French. 1 ill., 500 words. Municipal Journal, February 8. 10 cts.

STRUCTURES AND MATERIALS.

Engineering Problems in Viaduct Construction. The new viaduct will reduce the extreme congestion in traffic at 42d st. and Park ave. By Harry Gardner. 2 ills., 2,200 words. Engineering World, February 1. 15 cts.

Empirical Column Formulae for Brick Piers. Tests at University of Toronto on piers of various lengths built of brick of known strength to determine effect of slenderness ratio on strength of the piers; detailed report of tests on 14 piers and 62 individual brick. By Wm. W. Pearse, city archt. and supt. of bldg., Toronto. 4 ills., 1 table, 2,000 words. Canadian Engineer, February 20. 15 cts.

Flood Strikes Centers in 12 Days. But does no damage to big reinforced concrete truss bridge over Etobicoke river on Toronto-Hamilton highway. 2 ills., 300 words. Canadian Engineer. February 13. 15 cts.

Mammoth Derricks Build Concrete Outlet for Lockington Dam. Gravel from excavation washed ond screened for concrete; all operations mechanical from pit to forms. 2 ills., 1,000 words. Engineering News-Record, February 13. 20 cts.

Sheet Piling and Forms Used at Troy Dam and Locks. Eight different cofferdam operations; type of piling specially suited to cellular work; steel and wooden forms used. 7 ills., 3,800 words. Engineering World, February 1. 15 cts.

Operating Details of an Electrically Operated Cement Mill. Progress of material through mill; process of cement manufacture; apparatus and size of motors utilized. 4 ills., 3,200 words. Electrical Review, February 8. 30 cts.

GOVERNMENT AND FINANCE.

Why the Commission-Manager Form Is Preferable to the Commission Form of Government. From a paper prepared for the last annual convention of the League of Pacific Municipalities. By R. E. Bosshard, city clerk and ass't city mgr., Alameda, Cal. 2,500 words. Engineering and Contracting, February 12. 15 cts.

Needed Revision of Public Improvement Bond Laws. Proper revision of the statutes will greatly benefit cities and towns; principle of limited tax rate should be discarded. By I. E. Dierdorff, Davenport, Ia. 1,800 words. Engineering and Contracting, February 12. 15 cts.

Increasing Municipal Revenues. Editorial discussion of the serious problem presented to most cities, due to the loss of revenue from liquor licenses and the general upward trend of municipal expenses. 600 words. Municipal Journal, February 8. 10 cts.

Increasing Municipal Revenue. Why higher per capita revenues are necessary; methods employed by the larger cities of the country for increasing revenue; delinquent taxes; exemptions; license taxes on various kinds of business. 1 ill., 4,200 words. Municipal Journal, February 15. 10 cts.

Comparison of Various Existing and Proposed License Laws. Form suggested by joint committee of national societies in 1915 used as a basis in several states, many societies are working on legislation. 8,500 words. Engineering News-Record, February 27. 20 cts.

MISCELLANEOUS.

Town Planning. First question to be considered is its industry, which is the condition of its being; health, convenience, beauty, are the conditions of its well-being; problems of housing and growth; question of air space. By Thos. Adams, town planning adviser. Commis-

(*Continued on page 214*)

NEWS OF THE SOCIETIES

March 25, 26.—AMERICAN WATER WORKS ASSOCIATION, ILLINOIS SECTION. Eleventh annual meeting, Urbana, Ill. Secretary, G. C. Habermeyer, acting chief, State Water Survey, Urbana.

April 14-18.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Mineral Wells, Tex. Secretary, F. A. Rountree, Birmingham, Ala.

April 25-26.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, Logan Hall, West Philadelphia, Pa.

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

AMERICAN ROAD BUILDERS' ASSOCIATION.

Mr. Pinckney's subject on Wednesday morning (as stated in last week's issue) was "Foundations for Heavy Horse-Drawn and Motor-Truck Traffic." By means of screen views he showed the great increase in heavy traffic in recent years in New York streets—traffic reaching 300 to 400 tons per foot of width of street per eight-hour day. He said, however, that what is underneath a pavement is almost as important as what goes over it. He showed pictures of the intricate systems of ducts and mains underlying Manhattan streets, and pointed out that the street foundation must allow of access to sub-surface structures. Describing methods in Manhattan, he said that out of 400 miles of streets for heavy traffic 2 miles have macadam foundations, 154 have old stone and 304 miles have concrete. Macadam and stone, he found, were not satisfactory foundations for heavy traffic because they do not offer sufficient resistance. The concrete foundations are six inches deep, 1: 3: 6 mix. He discussed the advisability of increasing the depth, estimating that it would cost $100,000 a year more to add one inch and $180,000 more for two inches, 400,000 square yards being repaved annually. He found that only 0.05 per cent of failure (yardage) could be ascribed to disturbance of sub-surface in 1916 and 0.08 per cent in 1918. These failures cost $30,000 a year, so that increasing the depth would be uneconomical. He asserted that the great cause of failure was cutting, 150,000 yards of concrete foundation having been cut by openings in 1918, while only 7,900 yards failed for other reasons. He therefore urged the installation in all growing cities of adequate pipe galleries. He also took up failures due to drainage.

Mr. Goodsell (New York City) added to the figures given in the paper. He said that New York City has 100 miles of streets carrying traffic greater than 100 tons per foot of width per eight-hour day. Fifth avenue carries 250 tons in summer and 550 in winter.

Resolutions.

At the final Friday afternoon session, following a business meeting, the resolutions committee presented its report on resolutions brought up during the convention, and the following were adopted:

Freight Rates on Road Materials.

Whereas, The resumption, stabilization and progress of all business activity depends upon the quality and economy of transportation service afforded by the highways, railways and waterways, and

Whereas, lack of parity of these agencies exists due to the serious neglect of our highways, therefore be it

Resolved, That it is necessary to the welfare of the country that the highways be improved to supplement railroad efficiency and to meet present needs, and that to do this, railway transportation for road materials must be employed for the movement of a very large tonnage.

Resolved, That it is in the public interest that freight rates for the movement of road materials should be so readjusted as to permit adequate distribution of the materials essential to road improvement which will furnish employment for many thousands of men who might otherwise find themselves without work.

Stimulation of Road Building.

Whereas, there exists an immediate and pressing need for the absorption of labor during the period of transition from war to peace activities, and

Whereas, the Department of Labor through its several divisions is doing all in its power to stimulate immediate construction of good roads, and has called upon industry to cooperate with it in its reconstruction campaign,

Now Therefore, Be It Resolved: That the American Road Builders' Association does heartily endorse the efforts of the Department of Labor.

Motor Vehicle Limits.

Resolved: That the American Builders' Association favors the following regulations of motor trucks on the public highways.

1. The gross weight of vehicle and load shall not exceed 28,000 lbs. on four wheels.
2. The total height shall not exceed 12 ft. 2 in.
3. The total width shall not exceed 96 in.
4. The total length shall not exceed 28 ft.
5. The total weight per inch width of tire (measured at the base of rubber) shall not exceed 800 lbs.
6. The speed of motor trucks and trailers entirely equipped with solid rubber tires shall not exceed 15 miles per hour, and be it further

Resolved: That the secretary be and hereby is directed to forward copies of this resolution to the governors, state legislatures and the state highway commissioners.

National Highway Commission.

Whereas, The President of the United States in his recent message to Congress, recognized the value of improved highways in the general transportation system of the nation and definitely recommended and urged their rapid development; and

Whereas, This work is necessary to give employment to our returning soldiers and also to furnish worthy projects on which unemployed labor can be engaged during the period of readjustment, and

Whereas, We recognize the necessity for a well defined and connected system of improved highways in order to expedite the distribution of large volumes of foodstuffs now wasted on account of the lack of prompt and adequate highway transportation and to better serve the economic and military needs of the nation.

Therefore, Be It Resolved: That a National Highway Commission be created to promote and guide this powerful economic development of both highways and highway traffic and establish a National Highway System.

Be It Further Resolved: That the present appropriations for federal aid to the states be continued and increased and the states urged to undertake extensive highway construction so as to keep pace with the development of this country and its transportation needs, and in carrying out the provisions of the present Federal Aid Act or any amendment thereto that the National Highway Commission when created shall cooperate with the State Highway Departments.

Be It Further Resolved: That all federal government activities with respect to highways be administered by the National Highway Commission.

Resolutions of Thanks.

Resolved, That the American Road Builders' Association, in convention assembled, does hereby express its deep feeling of appreciation of the courtesies extended to it by the State and City of New York, the Bureau of Highways of the Borough of Manhattan, the Fifth Avenue Coach Company, the Hotel McAlpin and the Merchants' Association of the City of New York, and the active cooperation of the American Automobile Association, the Highway Industries Association, the Motor Truck Association of America, the National Highways Association, the National Highway Traffic Association and the public press.

Resolved: That the American Road Builders' Association, in convention assembled, does hereby express its sincere appreciation of the entertainment provided on the occasion of the annual dinner of the association at the Waldorf-Astoria Hotel by the local entertainment committee, composed primarily of manufacturers of road machinery and materials.

Resumption of Road Building.

Resolved: The American Road Builders' Association emphatically favors the immediate extensive and comprehensive resumption of road building by municipalities, county, states and the nation.

Return of Highway Engineers in France.

Whereas, Immediate and extensive resumption of highway construction will materially aid in solving the labor and transportation problems and

Whereas, Large sums of money have been appropriated, definite and comprehensive plans have been prepared and the only serious drawback to road building on a large scale is the lack of capable road engineers, contractors, foremen and experienced superintendents of construction, and

Whereas, Great numbers of highway builders patriotically enlisted and are now overseas, therefore be it

Resolved: That a committee of three be appointed representing the American Road Builders' Association to urge the Secretary of War to take all necessary steps to hasten the demobilization of engineering units, including the 23rd, 28th, 41st, 42d, 43d and 101st Engineers and facilitate their quick return, that they may lend their invaluable and indispensable aid to arts of peace, thus insuring the efficient expenditure of the highways funds of the cities, counties, states and the nation.

"Roosevelt Road."

Resolved, That a great highway, to be known as the "Roosevelt Road," traversing his native state of New York should be constructed to accommodate the rapidly increasing traffic; this road to be built in such location as will permit easy grades and alignment, to have a paved surface not less than 22 feet, and to be provided with a foundation which will sustain present and future traffic.

Increased Federal Aid.

Whereas, The American people keenly sense the important place occupied by the transportation question in the great problems of reconstruction and extended national development; and

Whereas, The American people are sharply impressed not only with the many advantages arising from good roads, but particularly with the enormous economic losses due to bad roads; and

Whereas, The United States is the richest of all nations, yet in four years the national debt has increased twenty-five fold and the carrying charges of this

gigantic liability leaves this country less able than ever before to sustain the burden of bad roads, and the above mentioned obligations, together with high prices, are an unanswerable argument not for a postponement or curtailment of the road building program, but rather for a more aggressive, more extended and more comprehensive plan of highway transportation, involving vastly increased appropriations; therefore, be it

Resolved, That the American Road Builders' Association at its sixteenth convention express its satisfaction with the patriotic action of the Congress of the United States in the $200,000,000 increase in the federal aid highway scheme and in the action of many states, counties and cities, some of which have already provided large funds and others of which are conducting active campaigns for rda building purposes.

Improved Types of Highways.

Resolved: That all state and county highway governing bodies be urged to advocate, whenever necessary, new appropriations and to extend road system of wider, more durable and approved types, in order to keep pace with the intensified and multiplied highway transport requirements of today and tomorrow.

THE TENTH NATIONAL GOOD ROADS EXHIBIT.

The "show" was attractive and made a fine showing considering the limitation of exhibits to such as could be shown in the hotel. The display was arranged in the Winter Garden of the hotel, on the same floor as the meetings. All the exhibitors distributed descriptive literature. The following is a list of exhibitors:

Acme Road Machinery Co., Frankfort, N. Y.

Amies Road Co., Easton, Pa.—Specimens, slabs of Amiesite road, photographs,, etc.

Barber Asphalt Paving Co., Philadelphia, Pa.—Strikingly effective photographs of Trinidad asphalt pavements; literature describing Iroquois equipment, including portable asphalt mixing plants, tandem rollers, asphalt kettles and tools, etc.

Barrett Co., New York, N. Y.—Photographs of Tarvia roads; samples.

Bitoslag Paving Co., New York, N. Y.—Specimen slabs of Bitoslag and Bitosan pavements; photographs; interesting and useful souvenirs.

Blaw-Knox Co., Pittsburgh, Pa.—Steel forms for concrete road, sidewalks, curb and curb and gutter construction.

Burch Plow Works Co., Crestline, O.—Working models of stone spreader, loader and unloader and of culvert pipe. The spreader has performed the labor of six to eight men on actual work. The loader unloads direct from railroad car to motor truck.

John F. Byers Machine Co., Ravenna, Ohio.

Philip Carey Co., Lockland, Cincinnati, Ohio.

Dunn Wire-Cut Lug Brick Co., Conneaut, Ohio.

Franklin Contracting Co., New York, N. Y.—Specimen slabs of "National" pavement; samples of soils from which "National" pavement aggregate may be made; photographs.

Good Roads Machinery Co., Kennett Square, Pa.

Granite Paving Block Manufacturers Association of U. S., Boston, Mass.

W. & L. E. Gurley, Troy, N. Y.—All types of surveying instruments, including transits, levels, compasses, rods, sketching cases, etc.

Hastings Pavement Co., New York, N. Y.

Headley Good Roads Co., Philadelphia, Pa.—Photographs of pavements; samples of asphalt patch material.

Hercules Powder Co., Wilmington, Del.

Ingersoll-Rand Co., New York, N. Y.

Keuffel & Esser Co., New York, N. Y.—Surveying instruments of all kinds, including transits and levels, drafting instruments; samples of tracing paper; solar ephemeris and data book.

Keystone Driller Co., New York, N. Y.

Kinney Manufacturing Co., Boston, Mass.—The Kinney asphalt pump for handling asphalts; literature describing all types of Kinney pumps, auto distributors, heaters and distributors, street flushers, tar and asphalt spraying nozzles, pressure head sprayers, strainers, etc.

Koehring Machine Co., Milwaukee, Wis.—Moving pictures of Koehring concrete mixers and other equipment at work. These drew a big audience all the time and proved a very effective way of taking the crowd out on the job at very little expense and trouble.

Novo Engine Co., Lansing, Mich.

Portland Cement Association, New York, N. Y.

Standard Oil Company (New Jersey), New York, N. Y.—Photographs of streets and roads.

Standard Oil Company (New York), New York, N. Y.—Specimens of asphalt; souvenir memorandum books.

Texas Company, New York, N. Y.—Samples of Texaco asphalt; striking photographs of asphalt pavements; paving fillers.

Thew Automatic Shovel Co., Lorain, O.

United States Asphalt Refining Co., New York, N. Y.—"Aztec" asphalt pavements; photographs; souvenirs.

Warren Brothers Company, Boston, Mass.—Specimen slabs of Bitulithic and Warrenite pavements; photographs. This exhibit had a commanding place in the show.

White Company, Cleveland, O.

Willite Road Construction Co. of New York, New York, N. Y.—This exhibit was distinguished by being the only one presided over by a lady, who proved that the highway business is not only a man's business. There were displayed photographs and advertisements of Willite pavements and specimen slabs, soils, etc. The souvenirs were the kind that are kept, being a splendidly illustrated and printed edition of Pershing's own story of the A. E. F. in France.

Wyoming Shovel Works, Wyoming, Pa.

L. A. Young Industries, Inc., Detroit, Mich.

H. H. Robertson Co. (formerly Asbestos Protected Metal Co.), Highway Materials Dept., Pittsburgh, Pa.—Samples of paving joint and reinforcing for concrete roads.

Berger Manufacturing Co., Canton, O.—Metal culverts; filing cabinets of steel.

Connery & Co., Inc., Philadelphia, Pa.—Literature describing all kinds of asphalt heaters.

Contractors Service Co., New York.

MUNICIPAL INDEX

(*Continued from page 212*)

sion of Conservation. 2,800 words. Canadian Engineer, February 13. 15 cts.

Town Planning in Canada. Outline of the work of Commission of Conservation; relation to housing and land problems. By James White, deputy head, Commission of Conservation, 1,700 words. Canadian Engineer, February 6. 15 cts.

What About the Government Housing Program? Engineers should be active in study of housing in general and of solution of the problem of disposing of those government projects already under way. By Morris Knowles, chief engr., div. of transportation and housing, U. S. Shipping Board, Philadelphia. 2,800 words. Engineering News-Record, February 13. 20 cts.

Developing Ambition and Confidence in Employes. Discussion of some of the elements which enter into success and the stimulation of ambition, by the general manager of the Niagara Light, Heat and Power Co., George Wehrle, 1 ill., 2,600 words. Gas Age, February 1. 20 cts.

Operating an Employment Bureau for Civil Engineers. How a technical society conducts a registration office; tries also to place employed, but not satisfied men. By C. S. Rindsfoos, chairman, registration bureau, Cornell Society of Civil Engrs., N. Y. C. 1,100 words. Engineering News-Record, February 6. 20 cts.

The Economic Duties of the Engineer. He should saturate himself with sound economic doctrine; just as much the basis of his professional work as the sciences of physics and chemistry. From presidential address delivered before the Mining and Metallurgical Society of America, by W. R. Ingalls. 1,500 words. Engineering and Contracting, February 19. 15 cts.

The Economic Duties of the Engineer. In the presidential address before the Mining and Metallurgical Society of America, January 14, W. R. Ingalls presented a discussion of the present duties of engineers in relation to economic problems of the future; parts concerning civil engineers most directly are here reproduced. 4,200 words. Engineering News-Record, February 6. 20 cts.

General Professional Meeting at Ottawa. Combined with annual meeting of the Engineering Institute of Canada; report of proceedings; addresses by the governor-general, minister of public works and others; discussions on highways, hydroelectric ice troubles and railway electrification. 4 ills., 20,000 words. Canadian Engineer, February 20. 15 cts.

Specifications for Public Works. Editorial comment on the faultiness of specifications, the lack of logical or intelligent arrangement of the parts of the specification and the inexact or improper use of the language employed to express the ideas. 700 words. Municipal Journal, February 1. 10 cts.

Reclamation of Swamp Lands in Dane County, Wisconsin. 14 drainage districts organized; costs; seven-foot pond changed to corn field. By W. G. Kirchoffer, sanitary and hydraulic engr., Madison, Wis. 2,000 words. Municipal and County Engineering, February. 25 cts.

Methods and Cost of Riprapping Embankment by Wire Bag Method. 1 ill. 500 words. Engineering and Contracting, February 12. 15 cts.

Portable Stone Crusher Saves Cost Every Year. Omaha company crushes 935 cu. yd. of stone in a period of six months at an actual saving of $1,500 1 ill., 400 words. Electric Railway Journal, February 8. 15 cts.

How the New York Canal Concrete Barge is Being Built. In four yards independently at work on same type of boat differences may be noted in yard layout, launching schemes, form construction and steel placing. 19 ills., 4,500 words. Engineering News-Record, February 6. 20 cts.

Long Beach Municipal Markets. Outdoor markets and fish market pay all expenses from small fees charged. 900 words. Municipal Journal, February 1. 10 cts.

City and County Engineers Write of Construction Projects Planned to Provide Buffer Employment for Labor during Readjustment Period. 20,000 words. Municipal and County Engineering, February. 25 cts.

Work as a Coagulant. Editorial discussion, recommending work as the best means of settling the social and industrial unrest, following the most violent and protracted storm of history. 800 words. Municipal Journal, February 15. 10 cts.

Opportunity Is Here: Let Us Meet It. We must grapple with the problems involved in transition from an old order to a new order and forge ahead with the conviction that success will attend our efforts. By L. K. Comstock. 2,400 words. Electrical World, February 8. 15 cts.

Performing Municipal Construction Work by Day Labor in Flint, Mich. Relative costs; contact versus day labor system. By Ezra C. Shoecraft, city engr., Flint. 1,500 words. Municipal and County Engineering, February. 25 cts.

Civil War Price Trends Compared with Those Today. Judging by past, prospect is that high prices will continue; should not retard immediate building. By Morris Knowles, engr., Pittsburgh, Pa. 2 ills. 1,500 words. Engineering News-Record, February 27. 20 cts.

Municipal Journal

Volume XLVI NEW YORK, MARCH 22, 1919 No. 12

REPAIRING PAVEMENT OPENINGS

Practices of Several Hundred Cities as to Methods of Restoring Pavements—By City Employes or by Parties Making the Opening—Charges by Cities for Making Repairs—Minimizing Number of Pavment Cuts.

One of the causes most common and conspicuous in hastening the deterioration of a pavement is the making of cuts in the same for the purpose of laying pipes, either main or service connections, or making excavations in order to repair such pipes, or for other reasons. With the best of workmanship it is none too easy to patch a pavement in such a way that it will be as sound and durable as before and that the patch will not be visible as an eye-sore. If great care and skill are not used, a few patches to a block may so disfigure a pavement and, what is more serious, may cause such depressions in it as to greatly diminish its value as a smooth pavement and shorten its serviceable life.

The ideal would of course be to absolutely prevent cutting openings in a pavement, but we believe that no city has yet found this to be possible. It is undoubtedly possible, however, to greatly reduce the number of openings especially in the first few years after the pavement is laid, and also to use greater skill and care in restoring the pavement so as to minimize the injurious effect of the cut. It is now a more or less common practice, especially in the larger cities, to give notice to the fact when a new pavement is to be laid in a given street and of the ordinance and regulation of the city requiring that for a given period thereafter (generally not less than two nor more than five years) no permit will be granted for opening that street. Such a warning as erected by the city of Cleveland is shown in the accompanying illustration. New York City posts similar warning signs, except that they are much smaller, being approximately 18 by 24 inches and are fastened to lamp standards or other posts at the ends of each block to be paved. The warning should in this or some other way be brought prominently to the attention of all concerned.

-WARNING-
THIS STREET WILL BE PAVED -
All Underground Structures Gas and
Water Pipes, etc; Must be put in at once.
After Completion no permit to Cut
will be granted for Five Years.
HARRY L. DAVIS, MAYOR.

CLEVELAND'S NOTICE OF PROPOSED PAVING.

Public service corporations and municipal departments should be notified directly by letter and requested to complete all underground construction or repairs that are contemplated or likely to be needed within the next several years.

It is, of course, necessary to grant permits for emergencies such as repairing leaks or breaks; but the city officials in charge should maintain a stiff backbone and adhere to the ruling, especially refusing permits for any new pipes or other structures. This ruling should be enforced as rigidly on the water and sewer departments as on any other parties. In many cities the municipal departments are the worst offenders. The Department of Water Supply of New York City until a few years ago was continually opening pavements that were only a few days or weeks old and did hundreds of thousands of dollars damage to pavements in this way.

Given two or three months of working weather after such a warning and it should be possible to arrange for and lay all underground structures that may be needed, including service connections to the curb. Those who do not take advantage of the opportunity should suffer for their delay by an additional enforced delay for the designated period.

WHO REPAIRS CUTS?

In spite of all precautions, however, it will be necessary to make occasional cuts in pavements. In replies to a questionnaire sent out a few weeks ago, about 300 city engineers informed us of the practice of their cities in repairing such cuts. This information has been tabulated and arranged by sections of the country, and is summarized below.

The first questions asked was as to who was in charge of making the repairs, the city or the parties who made the opening. Totaling the entire country, 145 cities, or

56 per cent. had the pavement repairs made by the city employes; while 96, 37 per cent permitted or required the parties in whose behalf the opening was made to make the pavement repair; and in 18 cities the repairs were made sometimes by the city and sometimes by private parties. In quite a number of those cities in which pavement repairs were made by private parties, probably about one-quarter of them, it was stated that such repairs were made under the supervision of some city official, and it is quite probable that in a number of other cities this is the rule also but that the fact was not stated.

Classified by districts, these figures are shown in the table.

VARIOUS PRACTICES CLASSIFIED BY DISTRICTS.

	Pavement Restored Over Cuts By			Method of Replacing Concrete Base			
	City.	Parties making opening.	Both or either.	Overlap edge of trench.	Overlap and make heavier.	Do not overlap.	Reinforce concrete.
New England	11	2	3	12	0	1	3
Middle Atlantic	29	28	3	51	4	17	14
South Atlantic	9	2	0	5	2	1	4
Gulf	8	3	0	5	0	5	1
Central	30	41	7	55	9	11	16
North Central	'35	14	1	36	3	6	17
Rocky Mountain	7	2	1	4	2	4	0
Pacific Coast	9	4	3	11	2	4	2
Canada	7	0	0	4	0	1	3
	145	96	18	183	22	50	60
Per Cent.	56	37	7	68	8	18	22

Two cities announced that the work of making pavement repairs was done by a contractor selected by the city, but paid, we presume, by the party making the opening. Three cities announced that as yet no cuts have been made in any pavements in their streets; from which we judge, based on experiences elsewhere, that permanent pavements have but recently made their appearance in those cities. In Pittsburgh, Pa., and one or two other cities, the party opening the street makes temporary repairs to the pavement, and later, when the backfilling has presumably finished settling, the city makes permanent repairs. Several cities made note of the practice (which prevails in quite a number) of an arrangement with the contractor for guaranteed pavements whereby said contractor replaces all cuts in pavements made by him. In a few cities it was stated that if the party making an opening failed to replace it properly within a given time the city performed the work and charged him for it.

In several of the replies the writer stated that, although it was not the practice in their cities, it was their belief that the city should itself make all pavement repairs rather than permit it to be done by plumbers or parties even less reliable and experienced in street paving work. The fact that in 56 per cent of the cities reporting, these repairs were made by city forces, while in an additional 7 per cent some of the repairs were so made indicates that this is the prevailing opinion, especially in view of the fact that it is simpler and more in line with the ordinary practice of a few years ago to leave the whole affair in the hands of the plumber, gas company, or other party opening the street.

In Champaign, Ill., a regular form is employed which is filled out by the city official in charge, giving the complete description of the work of making a repair. This form contains spaces for the name and address of the party digging the trench, the location of the opening and the description of the work, the date commenced and date finished, number of job and date when billed. Under the heading of "Labor" is filled out the name of each man working on the job, the position which he occupied, hours on the jobs, rate per hour and total amount charged to the job. Under the head of "Materials" are recorded the items (cement, gravel, sand, etc.), the quantity, unit cost and amount, with the total cost of material; under which are spaces for materials returned, such as empty cement sacks, for which credit is given. On the other side of the form is space for a sketch by which the exact location of the repair is indicated; also a summary of the items on the other side under the heads of "total labor," "total material," "overhead," and "total cost." Also a space for a detailed description of the work. In the sample sent us, under the head of "labor" was listed a foreman, two-horse team and driver, three laborers, one water boy and a one-horse wagon. Under "material" cement, gravel, sand, ⅜-inch steel rods, paving brick, and cinders. The labor totaled $12.64; material, $5.85; no charge for overhead. The work was described as follows: "This ditch was originally filled in with frozen dirt by the Reliable Plumbing and Heating Company. The dirt melted, causing caving, and necessitated refilling and tamping twice with cinders. To make permanent repair, the hole was excavated to 12 inches below surrounding pavement, bricks were removed and concrete cut wide enough to give ⅜-inch reinforcing bars one foot of solid bearing on each side, and on this well-tamped surface a 7-inch reinforced concrete base was spread. After hardening, a one-inch sand cushion (mixed one part cement to six parts sand) was luted to grade and a sand-filled brick pavement was relaid. All good brick was cleaned and used again. Hauling consisted of four yards of cinders to, material to, barricade and tools to and from, and all refuse from job; average haul one-half mile. Size of hole for brick and concrete 10 feet by 4 feet = 4.44 square yards, and 0.86 cubic yards of concrete."

In most cities there are regulations governing street openings, under which those making openings are required to either file a bond for a year or a bond for each application, or to make a cash deposit to be returned after the repaving is satisfactorily performed, or the balance returned after the city has made the repair and deducted from the cost thereof. Unfortunately, there are some cities (especially the smaller ones, we believe) which do not have or at least enforce any such regulations, but in which street openings are made by plumbers or others without even the formality of obtaining a permit from any city department.

CHARGE BY CITY FOR REPAIRS.

The principles upon which the cities base their charges for replacing pavement vary in different cities. Seventy-two cities reported that they charge the "cost" of the work, "actual cost," "total cost," etc. Eighteen others charge cost plus a percentage, the percentage being 5

in one case, 10 in nine cases, 15 in five cases, 20 in one case, and unstated in two cases. Cost plus a fixed sum is charged by four cities, three charging $5 additional and the fourth "the overhead." One charges "cost plus material damage to street as a whole."

Most of the remainder, 36 in all, make a fixed charged per square yard or square foot of pavement restored. Among the charges are: "50 cts. a sq. ft.—a minimum of $5." "Asphalt macadam $2.50, brick $5, wood block $6 per sq. yd." "$4 per yd. for brick, $3 for asphalt· $2 for macadam." "$4 for gravel, $6 for brick, $8 for concrete." "Same per yard as original cost." "$2.50 for bituminous and cement concrete, $4 for granite block." "$5 per opening on unpaved, $10 on paved." "Wood block 50 cts. per sq. ft., asphalt 45 cents., brick 35 cts., bituminous macadam 25 cts., concrete 25 cts." "$5 per first sq. yd., $2.50 for each additional sq. yd." "Amiesite on macadam base, 30 cts. per square foot; Amiesite on concrete base, 35 cts. per square foot; Dolorway on concrete base, 30 cts. per square foot; brick on concrete base, 40 cts. per square foot; wood block on concrete base, 55 cts. per square foot; macadam or stone-surfaced streets, 10 cts. per square foot; streets not paved or macadamized, 5 cts. per square foot." In the last case a reduction of 15 per cent is made where the area exceeds 200 square feet; and in calculating the area where there is a concrete base or concrete pavement, the area paid for includes one foot additional on all sides of the opening. In one city, a "lump sum estimated in each case." In another city "actual cost plus $1 for restoration that costs $10 or less, and plus 10 per cent for more than $10."

METHOD OF MAKING PAVEMENT REPAIRS.

Of about 300 cities replying to these questions, about 30 made no report as to the method of making repairs, or else stated that there were no pavements in their cities on concrete base. Of the 270 cities describing the method of replacing concrete base in pavement openings, 178 stated that in doing so they broke back the concrete so that the opening was wider than that in the earth beneath, thus causing the new slab of concrete base to overlap and rest upon the edges of the trench or other opening. In addition to these 178, six reported that they required this overlapping in some cases but not in all. Many of those reporting this overlap stated that they also beveled the edges of the concrete so as to give a wedge shape or keystone shape to the new concrete, and it is probable that a considerable percentage follow this practice. In at least two cases, however, it was specifically stated that the edge is cut square and vertical. One engineer reported that they had found that if the edges of the concrete were cut back sloping, when the concrete expanded and contracted by heat the new patch separated from the old, being wedged out. The amount of overlap varied from four inches to twelve inches, only four cities giving as low as four inches, twelve giving six inches, six giving eight or nine inches and fourteen giving twelve inches. The others did not specify the amount of overlap.

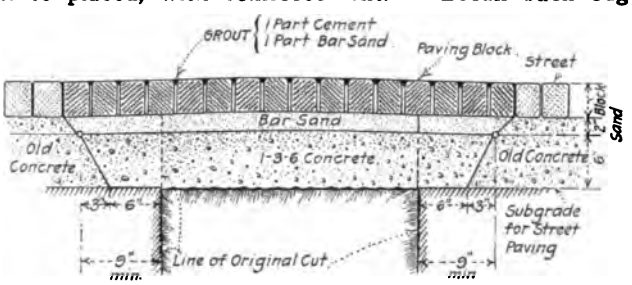
In addition to these 21 cities stated that they not only required the overlap, but also made the new foundation thicker than the original one. The amounts of excess thickness, where they were specified, were as follows: One, six inches thicker; one, six to ten inches; one with a total thickness of eight inches; one, twice the original thickness with a twelve-inch lap; one, two inches thicker with a twelve-inch lap; one, seven or eight inches thicker with a three-inch lap; one, six inches thicker with an eight-inch lap.

Fifty stated definitely that they did not make the new patch overlap the sides of the trench, but a considerable percentage of these stated that they beveled the edges of the concrete, two stating that this bevel was given a slope of about 45 degrees; one, however, stating that the edge of the concrete was cut down square.

Five reported that they made the concrete thicker, but did not overlap.

That the use of reinforcement in concrete foundations is increasing was indicated by the fact that 45 cities reported the use of reinforcement in all patches and 15 that reinforcement was used in some cases. One reported the use of half-inch rods for this purpose, another the use of three-eights-inch rods. Where the reinforcement was used under certain conditions only, these conditions were described as "deep trenches," "large openings," "if wider than two feet," "if more than thirty inches," "if very wide," "for extra heavy traffic." One city in California uses fabric reinforcement. Almost all of those using reinforcement report overlapping the concrete also.

The accompanying sketch, showing the method of making repairs at Reading, Pa., is typical of the plan apparently employed in most of the cities where the patch overlaps the sides of the trench. Among certain of the descriptions given of the methods of replacing foundation are the following: "Sides of cut thoroughly cleaned, made rough and vertical and loose chips removed; new concrete put in place and protected from traffic for 72 hours, being covered with wet sand bags." "Trench filled to within two inches of surface. Planks placed flush with pavement. Allowed to settle for one month, then excavated one foot deeper and one foot wider than old opening. Edges of old concrete beveled and new concrete placed, with reinforcement." "Break back edges



REPAIRS TO BREAK IN PAVEMENTS, READING, PA.
Backfill in layers not exceeding 8", to be moistened as directed and well tamped.

until fresh fracture is secured, wet down edges and then place concrete in order to secure good bond." "After the earth has been backfilled the operator must leave a bench eight inches wide all around the edge of the excavation six inches below the base of the wearing material, when it is turned over to the city for completion. The city then places the concrete base and charges the actual cost."

Three different methods of using reinforcement were described. In one of these, reinforcing bars, which extend across the opening, are given a double or Z bend at each end so that each bar rests upon the old foundation, the main part of the bar spanning the opening four inches below the top of the old base, which was five inches deep; the face of the concrete in this case having been broken off vertical. In another case, where the edge of the concrete was broken back sloping, the reinforcing bar was bent so that, when in place it followed parallel to the top of the old base for two or three inches, followed parallel to the sloping edge, and extended horizontally across the opening, the other end being similarly parallel to the concrete base on the other side. In the third plan, straight bars were used of such length that, when placed across the opening with the ends resting on the sloping edges of the concrete, the

bars would be at or slightly below mid-depth of the concrete base. One engineer reported that "the method, sad to relate, here in P——, is up to the parties making the opening, and the result of their efforts is a botched job nine times out of ten."

Quite a number of the engineers stated that they considered the backfilling of the trench of even more importance than the method of placing the concrete. One or two said that if the backfilling was properly compacted, there was no need for beveling the edge of the concrete or for using reinforcing. There may be some soils where it is possible to secure backfilling which, in at least nine times out of ten, will not settle further; but we believe that soils where this can be done are rare, except in the cases (which are equally rare) where the entire backfilling is done by men sufficiently experienced and conscientious to obtain such uniformly perfect work in every case.

Several cities report leaving the opening with only a temporary filling, postponing permanent repaving for two weeks, a month, or in one case a year. Meantime, the opening is filled in with broken-up concrete, bricks, stone blocks, planks, etc. The objection to this practice, in our experience, is that during the weeks or months while traffic is using the street, including the place thus temporarily filled, the edges of the opening are broken down, the bricks or blocks around the opening are loosened, the sand cushion is jarred or washed out from under the blocks, and in general the pavement is affected injuriously for a distance sometimes amounting to several feet around the opening. This increases the cost of making the repair to as much as the precautions of overlapping and reinforcing would amount to, there is a tendency to fail to relay as much of the disturbed pavement as should be, and during the presence of the temporary repair the pavement is rough and gives poor service. The backfilling should, of course, be compacted as thoroughly as possible, in order that, if a settlement should occur, it would be limited in amount; also in order that the bench of earth on which the overlapping patch in the concrete base rests may be supported against displacement as fully as possible. It is very difficult, however to so compact a trench that there will not be a settlement of at least a half inch or so, and a drop of this amount in a hard-surface pavement is not to be tolerated; for which reason the taking of all possible precautions for supporting the pavement independent of the new backfilling is, in our opinion, warranted.

WATER CONSUMPTION IN DETROIT.

Maximum Daily and Hourly Consumption—Use and Advantages of Meters—Computation of Saving Effected by Such Use.

In his 1918 report, George H. Fenkell, general manager for the Board of Water Commissioners of Detroit, Mich., gives an interesting discussion of the matter of water consumption in that city, and a calculation at some length of the saving to the city by the use of meters.

In the first place, all water is metered as it leaves the pumping station, and this eliminates from the calculation of consumption the pump slip and pumping station waste. Most of the water used for manufacturing is supplied through the city mains; for, although several that use large quantities at very low pressure, as for condensing purposes, take water from the river through private intakes, most of the manufacturing plants are located along the railroads at some distance from the river.

Leaks in the mains are less numerous than was formerly supposed and to a less extent this is true of service connections also. Since 1893 all mains have been tested at a water pressure of 80 to 100 pounds per square inch, and previous to March, 1918, such tests were made in the open trench. The use of water for lawn sprinkling, to prevent freezing, and the waste because of leaks in fixtures and plumbing, is rapidly coming under control through the general use of meters.

Large quantities of water are furnished without charge for public and charitable purposes. According to a careful estimate made in 1910, 7½ per cent of all water pumped during the fiscal year 1908-9 was used for public and charitable purposes. It is believed that this has now been increased to some extent, and that metering all connections as far as can be done reasonably, and charging each department and institution with all the water it uses, may reduce the quantity of water so used thirty per cent without causing inconvenience or working harm.

As Detroit is supplied with water by direct pressure, with no reservoir, the variations in consumption from hour to hour are easily observed. Records for the past nine years give the maximum daily and hourly consumption for each year as follows, the average for each year being taken as the basis or 100 per cent:

Year	Average Pumpage during year	Pumpage during max. day of year	Pumpage during max. hr. of year
1910.....	100%	138%	171%
1911.....	100	139	176
1912.....	100	139	159
1913.....	100	135	175
1914.....	100	134	164
1915.....	100	121	152
1916.....	100	124	151
1917.....	100	133	155
1918.....	100	145	157
Average.....	100%	136%	162%

INSTALLATION OF METERS

Although meters have been set during the past year at the rate of 97 per day during 300 working days, there are still 56,809 unmetered connections. Since 1910 meters have been placed as follows:

Year	No. of Taps	No. of Meters	Per Cent of Taps Metered
1910.....	87,822	8,827	10.1
1911.....	94,144	9,713	10.3
1912.....	101,158	10,807	10.7
1913.....	109,786	13,302	12.1
1914.....	118,410	17,051	14.4
1915.....	125,472	29,180	23.3
1916.....	134,369	46,991	35.0
1917.....	146,052	65,542	44.9
1918.....	151,439	94,630	62.5

During the winter of 1917-18, 4,088 meters were damaged by frost, of which 1,204 were located under kitchen sinks, generally in houses without basements; and 1,723 were damaged by hot water. Frozen meters and those damaged by hot water are repaired at the expense of the user.

Few consumers now object to meters, for it is well understood that meters benefit financially both the consumer and the city. For example, the consumption in dwelling houses has been examined by selecting a number from all parts of the city at random (see next page).

While it is not possible to determine with great accuracy what the flat rate would have been on the property listed above, a comparison of these payments with the flat rate charges for similar property will show a saving in favor of the meter charges of approximately one dollar per year per family.

It is also possible to show a great saving to the city at large due to the use of meters.

Consumption and Cost of Water in Dwelling Houses.

	No. of Houses Investigated	Size of Meter	Average Cost Per Quarter	Remarks
Dwelling house	400	⅝ in.	$1.70	one family
" "	89	¾ in.	2.20	one family
" "	11	1 in.	3.40	one family
" "	142	⅝ in.	2.49	two families
" "	54	¾ in.	3.10	two families
" "	4	1 in.	5.88	two families
" "	10	⅝ in.	4.24	four families
" "	72	¾ in.	4.54	four families
" "	18	1 in.	5.45	four families
" "	17	⅝ in.	5.31	six families
" "	11	¾ in.	4.09	six families
" "	63	1 in.	6.70	six families
" "	9	1½ in.	7.42	six families

From 1896 to 1912 the taps metered remained nearly constant at ten per cent, that is, during this period of 16 years only enough meters were set to cover one-tenth of the taps inserted. During this time the pumpage increased at such a rate that if allowed to continue would have reached, in 1918, 195 gallons per capita per day. By increasing the number of taps metered to 59 per cent, the consumption has been reduced to 152 gallons.

Year	Average Daily Per Capita Consumption Gallons	Per Cent of Taps Metered	Per Cent of Water Metered
1910	183	10.1	33
1911	177	10.3	35
1912	187	10.7	36
1913	175	12.1	37
1914	171	14.4	40
1915	162	23.3	41
1916	163	35.0	52
1917	165	44.9	59
1918	152	62.5	55

The expense of setting meters and the saving effected by their use can be arrived at reasonably close, although the 65,542 in use at the beginning of the year had been increased to 94,630 at the end of the year, June 30, 1918, and part of these new accounts were turned over from the flate rate ledgers during each quarter of the year.

The size of pipes, 12 inches and smaller in diameter, is determined by the needs of the neighborhood for fire protection, and the cost of that portion of the distribution system would not usually be affected by the use of meters.

The average daily consumption during the past year has been 144,704,009 gallons, or say 145 million gallons, of which, in even figures, 39 million gallons were used in the high service and 106 million gallons in the low service. Had there been no increase in the percentage of meters in use since 1912, the pumpage would now be at the rate of 195 gallons per capita instead of 152, and the average pumpage per day would now be 186 million gallons, of which 50 million gallons would be for the high service and 136 million gallons for the low.

	Average Consumption in Million Gallons		Pounds friction between Pumping Station and Water Office		Average pressure at Pumping Station to maintain same pressure as at present at Water Office	
	At Present	With only 10% of Taps Metered	At Present	With only 10% of Taps Metered	At Present	With only 10% of Taps Metered
High Service	39	50	11.95	19.1	65.56	72.7
Low Service	106	136	4.19	6.1	45.57	47.5
	145	186				

At the beginning of the year there were 65,542 meters in service, and 94,630 at the end of the year. As a meter set late in the year had less effect on consumption than one set earlier, it is assumed that the number in service at the end of the first half of the year, about 80,000 is the average number to use in computing costs and effects.

Therefore the installation of 80,000 meters, less 10 per cent of the numbers of taps, or 65,000 meters, has reduced the pumping station pressures 11 per cent for the high service and 4 per cent for the low service. As the pumping expense has been reduced approximately in like proportion, and as the pumping station expense during the past year was $208,518.05, there has been a credit during the year because of reduced pumpage and pressures of $69,506.00 determined as follows: (50x72.7 plus 136x45.7) divided by (39x65.56 plus 106x45.57)=133.3%. $208,518.05x33.3%=$69,506.00.

The further credit due to construction work made unnecessary because of reduced consumption due to meters set since 1912 will now be determined:

Item	Total Cost	Cost per Million Gallons	
Intake	$ 204,000		$785
Pumps, present	1,087,116	$4,181	
Pumps, under construction.	627,375	2,413	
Pumps, booster	53,000	204	6,798
Station, old	258,068	991	
Station, new	647,375	2,490	
Station, booster	307,000	1,180	
Boilers, etc.	294,887	1,136	
Miscellaneous	32,034	123	5,920
Land and Improvements..	860,225		3,309
P. S. Force Mains	375,300		1,440
Conduits	319,614		1,230
Canal, etc.—Canal	35,295	135	
Basin	36,980	143	
Dock	13,575	52	330
Force mains, 16 in. to 48 in. in diameter	7,965,856	30,638	$50,450

The interest charge and depreciation charge per million gallon capacity is computed and shown in the following table:

Item	Cost per Million Gallons	Interest Charge at 4½%	Depreciation Rate	Depreciation Charge	Interest Charge plus Depreciation Charge
Intake	$785	$35.33	1½%	$11.78	$47.11
Pumps, etc.	6,798	305.91	2	135.96	441.87
Stations	5,920	266.40	1½	88.80	355.20
Land and Imp'v'mts	3,309	148.91	...	....	148.91
P. S. Force Mains.	1,440	64.80	1½	21.60	86.40
Conduits	1,230	55.35	1	12.30	67.65
Canal, etc.	330	14.85	2	6.60	21.45
Force Mains	30,638	1,378.71	1½	459.57	1,838.28
		$2,270.26		$736.61	$3,006.87

The saving of 41 million gallons per day in pumpage during the past fiscal year because of meters set since 1912 represents a credit in interest and depreciation of 41 million gallons x $3,006.87, or $123,282. This, added to the credit in pumping station expense, $69,506.00, gives the total yearly credit due to meters of $192,388.00.

The average cost to the Board of meters in place has been $6.78, divided as follows:

Cost of meter	$6.48
Setting meter	.30
	$6.78

Thus the installation of 65,000 meters represents an investment of $454,700, and the interest and depreciation at 7 per cent amounts to $31,829.00.

The yearly cost per meter follows:

Repairs	$0.22
Reading	0.30
Overhead	0.065
Total	$0.585

65,000 meters at $0.585 equals $38,025 and the total yearly expense amounts to $69,854. This expense subtracted from the credit of $192,788 shows the saving to the city during the past year due to meters set since 1912 in excess of 10 per cent of the taps in service of approximately $122,934.

In computing the saving due to meters, it should be borne in mind that no charge has been made because of

cost to the consumer in preparing the plumbing for meter. While this cost is comparatively slight for new houses, it is estimated that for both old and new the average cost is $10.00 each, or $650,000 for 65,000 meters. Seven per cent of this amount is $45,500, so that if this is deducted from the saving due to meters previously stated, $122,934, and it is not at all certain that such a deduction should be made, there still remains a balance in favor of meters of $77,434.

In many cases these figures are based on costs of work which have been completed some time, as for example, the intake crib and tunnel which cost $204,000. Future work of this kind will cost more than double this amount. Then, too, the construction of large force mains in the immediate future, the laying of a considerable quantity of pipe in the down town district, and the building of a filtration plant, will all tend to increase the cost of supplying water and thus increase the saving due to meters.

It also pays to meter, because the careful, conservative consumer is not compelled to stand part of the cost of his neighbor's waste.

The many tons of coal saved during the past winter in Detroit through meters represent a much greater saving than can be expressed in dollars.

FEEDING BALTIMORE'S GARBAGE TO PIGS.

Probably the Largest Piggery in the World—Fifteen Thousand Pigs by May First—Terms of the Contract.

A contract was let by the city of Baltimore on December 21st, 1918, for disposing of its garbage by feeding to pigs, this service to begin May 1st, 1919, and continue until December 31st, 1923. Under this contract the city is to deliver the garbage to the contractor, who will pay the city annually therefor approximately $31,500.

From 1882 to 1901 Baltimore's garbage was barged six miles down the river and spread over the ground as a farm fertilizer. From 1902 to 1908 the city paid annually $147,300 for collecting, removing and disposing of the garbage, the contractor employing a reduction plant located in the heart of the city near the water front. This contract had been made for a period of ten years, but was terminated because of complaints of unsatisfactory collection and odors from the plant, the city purchasing the plant and collection equipment for $372,888.19. Another company leased the plant from the city for $10,000 a year, and contracted to dispose of the garbage for $75,000 a year. This contract ran until Dec. 31st, 1917, and was then extended for a year, the contractor, however, paying no rental for the plant.

Since 1915 the city had been making extensive studies and exhaustive investigations to learn what method of refuse disposal was best suited to the local conditions; and in a report dated Jan. 28th, 1918, Walter E. Lee, water engineer of the city, recommended that garbage be disposed of by reduction in one central plant; ashes by filling ravines, low marshes and swampy ground along the water front for reclaiming land; and rubbish by incineration, in three municipal incinerators, of the combustible portions, except recoverable merchantable articles.

In accordance with this recommendation, bids were asked for April 17th, 1918, offering an eleven-year contract under which the city would deliver to the contractor at the water front all garbage produced from all sources within the city, the contractor to pay a lump sum each year to the city. A flat offer of 35 cents a ton was received, the Cobwell process of reduction to be employed, but the Capital Issues Committee refused to approve the issue of stock for the erection of the plant and the bid was released.

Again bids were asked for, to be opened Oct. 16th, on alternate proposals on reduction and feeding to pigs, a sixteen-year contract for the former and five-year for the latter; but no bids were received. For the third time bids were invited, for Dec. 18th, on either reduction or feeding. In the case of reduction, a sixteen-year contract was offered, with a flat price per ton and an adjustment (to be stated by the bidder) in cents per ton for every upward or downward fluctuation in the market value of grease from a basic price of 8 cents per pound. The term for the feeding contract was five years, and an annual flat payment to the city for each ton of garbage delivered by the city. No bid was received for reduction and only one for feeding, and a contract under the latter plan was awarded December 21st.

THE PRESENT CONTRACT.

Under this contract the city will deliver the garbage to the contractor, this including towing it by barge to the site of the farm, the city realizing that collecting and removing garbage from the water-front dumping stations was simply an extension of the collection and removal from the residences and a matter in which the contractor has no primary interest. It is estimated that barging and towing will cost the city about $15,000 a year. The city will receive from the contractor for each ton of garbage three and one-half times the price per pound of live killing hogs on the Chicago market, as determined by averaging the top prices for each month.

Garbage is defined as "every accumulation of animal, fruit or vegetable food waste, containing not more than five per cent by weight of other refuse, generated by or resulting from the decay, deterioration, storage, preparation or handling of animal or vegetable matter in any place or at any point where food is prepared for human consumption, including all kitchen and dining-room refuse." The scales for weighing the garbage are located at the feeding site and all garbage is drained before weighing. The city will provide good primary separation and deliver the garbage in as fresh a condition as possible to the feeding site, with not less than four deliveries per week in summer and three deliveries per week in winter.

The specifications require that the piggery shall be operated subject to the general and local public laws and under the supervision of such veterinarian and sanitary officers of the county and state as have proper jurisdiction. The city also will employ a veterinarian who shall have continual supervision and inspection over the work of the piggery.

The garbage which is unfit for feeding or not consumed shall be removed from the feeding platforms, which shall be cleaned at least once a day, and disposed of by the contractor through sale or by plowing under the soil.

Until May 1st, 1919, at which time the piggery shall take the full quantity of garbage produced, the city, with its own forces, will temporarily dispose of its garbage by burying it in shallow trenches 18 inches deep and 5 feet wide, in which the garbage is placed 12 inches thick and covered with 6 inches of sandy soil. There will be 17,000 linear feet required to accommodate this temporary disposal of garbage until the piggery is in operation. The cost of the temporary dis-

posal is 85 cents a ton, against a former cost of $1.06 per ton under reduction, the towing cost being included in both figures.

THE PIG FARM.

The 160-acre farm, on which the feeding operations will be conducted, is almost level and has sandy soil, insuring good drainage, with considerable water through an extensive shore line. Scrub pine, chestnut and oak timber affords protection from the summer heat. The farm is owned by the city and was purchased at an average price of $140 per acre. It is situated on a point on the opposite side of the tributary of the Chesapeake bay on which the existing garbage reduction plant is located and this proximity to a plant which has been operating 11 years without any formal complaint or restraint is expected to insure a like operation of the piggery.

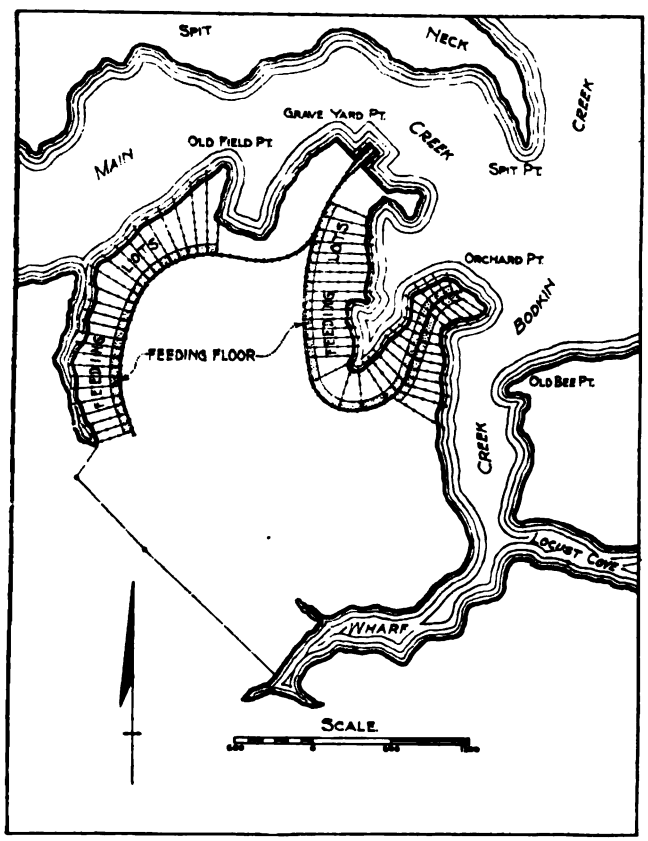
The area of Baltimore is 80.5 square miles and the estimated population, with the recently annexed territory, is 720,000. It is estimated that 15,000 hogs will be required to accommodate the maximum amount of garbage produced during the summer peak and it will probably represent the largest piggery in the world and Baltimore will be the largest city of the United States which has adopted this method for its disposal of garbage.

Young shoats, vaccinated with cholera serum, will be purchased in the open market and shipped to the feeding station, where approximately 100 animals will be placed in each feeding lot, 70 ft. by 250 ft. in size.

PLAN OF OPERATION.

Garbage will be unloaded from the city's scows at the feeding site by the contractor, by the use of a locomotive crane with a grab bucket of one yard capacity.

The garbage will be dropped into steel rocker double-side dump cars of ten yards capacity each, on an adjacent track, and hauled by an oil-burning locomotive directly down a lane between the feeding lots. as shown on the accompanying map.



SITE OF BALTIMORE GARBAGE FEEDING FARM.

The end of the feeding lots adjacent to the railroad will have a monolithic concrete feeding floor from which the animals are excluded by wide gates when the garbage is being dumped from the dump cars.

When the train has traveled the full length of its trip, the garbage will be spread on the return trip to the wharf by a spreader from the rear end of the train, after which the gates will be opened and each lot of hogs allowed to enter on the concrete feeding floors to eat the garbage.

It is confidently believed that disposal by feeding in a city the size of Baltimore does not entail any danger, as the size of herds necessary offers no greater problems than those present in herds numbering 5,000 and which have been successfully operated by the proposed contractor.

Disposal of garbage by feeding involves a relatively small capital investment which can be quickly and almost wholly liquidated at the expiration of the contract and in this respect differs from all reduction plants in which the machinery is of little use for any other purpose and possesses only a scrap value.

COLUMBUS WATERWORKS IN 1918.

Effect of War Prices on Department's Finances—Less Softening Chemicals Used—Costs and Results of Purification.

The report for the year 1918 of the waterworks of Columbus, O., by Jerry O'Shaughnessy, superintendent of the Division of Water and Sewage Disposal, gives considerable space to the discussion of the effects of war conditions, especially of war prices, upon the operation of the water purification plant of the city. Beginning with a balance of $127,803 at the beginning of the year, this was reduced to a balance of $50,979 at the end of the year. The large balance at the beginning of the year was due largely to the fact that that part of the appropriation for 1917 that had been intended for the purchase of chemicals for water softening was not exhausted because of the impossibility of procuring chemicals that year. This of course resulted in harder water during 1917 but the resulting saving made it unnecessary to raise the water rates this year, which would have been necessary had not the balance been available.

The expenditure in 1918 for the purification and softening of the water was a very large item in the operation of the plant, amounting last year to $306,972, while the total cost of construction, operation and maintenance, including the pumping and the distributing system, was $598,762. The cost of softening was greater last year than ordinarily, both because the river water was harder than in any previous year, and because the amount of water purified was greater; in addition to which, the price of chemicals was 25 per cent greater than the previous year. On the other hand, the expenditures for improvements were much less than ordinary, being only about $43,000, while for ten years previous to 1918 they had in no year been less than $125,000, and in 1912 and 1914 exceeded $300,000 per year. Part of this reduction was made possible by the less requirements for extending main lines and services, due to the falling off in building and other improvements in the city.

The reduction, however, was much more than offset by the increased cost of operation and maintenance. Previous to 1916 this expenditure had never amounted to more than $295,000, but in 1916 was $394,000, in 1917

more than $421,000, and in 1918 was $582,774. The cost of purification increased over that of the previous year by $103,271, but the cost of pumping was decreased $3,721, owing to the lower cost of coal in 1918, although 1,593 tons more were used. One cause of increase not due to the war was the repairing of the large number of meters which had been damaged by freezing during the extremely cold winter of 1917-1918.

Even this increase in expenditure given above would have been much larger had not precautions been taken wherever possible to keep it at a minimum. The water consumption had been approaching dangerously near the available supply for several years and a report on increasing the supply had been made by John H. Gregory, but to meet the necessity for economy he recommended, as an immediate and temporary arrangement, the placing of flashboards on the dam in order to raise the level of the impounded water. This is recognized as a temporary expedient only, and it will be necessary, as soon as funds can be obtained, to make a permanent addition to the height of the dam or build an additional one. The construction of the flashboards cost only $1,426, but enabled the city to furnish an adequate supply throughout the year.

Owing to the comparatively small number of new buildings, the number of meters in use was not greatly increased, only 572 being added. At the end of the year 96.66 per cent of the services were metered .

The cost of supplying water per million gallons pumped, based on total operating expenses, was $71.28, the cost including interest on bonds and sinking fund charges being $97.26.

In discussing the finances of the department, the report states that the city owes the department for water used through meters for municipal and charitable purposes the sum of $93,498. Mr. O'Shaughnessy states that payment of this is provided for in ordinances and resolutions already passed by the council, and it is therefore referred to as "constitutionally and lawfully due the Division of Water."

The average amount of water softened and filtered per day during 1918 was 23,800,000 gallons, or 106 gallons per capita. This is just about 10 per cent more than in 1917 and 20 per cent more than in 1916. During 1913-1915 the filtered water had a total hardness of about 85 parts per million but in 1917 this had increased to 125 parts, and was the same in 1918, this increase in hardness being due to the excessively high cost of chemicals. For instance, the prices in the year 1914 and 1918 respectively were as follows: lime, $5.27 per ton and $9.22; soda ash, $13.30 and $58.60; bleach, $29.20 and $54.56. Bleach and alum reached their maximum price in 1916, the former being $85, and the latter being $20.08 as compared to $7.27 in 1915 and $14.62 in 1918. These costs of alum represent the cost of the materials, the alum being made by the Division of Water.

The effect of the filters in reducing typhoid in Columbus has been remarkable. The filters were put into operation in 1908, in which year the typhoid rate among residents was 96.4 per 100,000, dropping the next year to 10.9, and no year since then exceeding 13.9, while during 1917 and 1918 the rates were 5.4 and 4.4 respectively. This reduction of death rates immediately following the installation of the filtration plant by from 85 to 95 per cent is certainly a remarkable showing.

It is the practice of the laboratory of the Division of Water to make not only presumptive tests for B. coli, but also confirmatory tests. During the year, thirteen of the 1 c.c. tests for B. coli were positive, but only three of these gave positive confirmatory tests, two being in October and one in December. Of the 10 c.c. tests 58 gave presumptive B. coli, and 24 of these gave positive confirmatory tests ,the greatest number of such tests being in October and December. It may or may not be significant in this connection that, of the twenty deaths from typhoid during the year, fourteen were during the months of September, October and November. The chemist in charge, Charles P. Hoover, remarks in this connection, however, that "October being the first month of the influenza epidemic, it seems possible that some mistakes of diagnosis may have been made."

Another feature of the operation of the purification plant was that during the last four months of the year the average length of filter runs between washings was about 50 per cent greater than during the other eight months of the year. However, the loss of head just before washing was no greater during this period than during the first eight months of the year. There may be some connection between the greater length of run between washings during the last four months of the year and the fact that during those months the period of coagulation averaged 16½ hours while during the other eight months it averaged 14½ hours. These suggestions are our own and it is quite possible that the facts pointed out are largely coincidences, since other conditions, such as turbidity of the water, rates of consumption, etc., may have been the deciding factors. In washing the filters no air was used in 1918. Water was used an average of five minutes per washing. The percentage of wash water averaged 0.8 for the year, the maximum being 1.3 in March and May and the minimum 0.5 in November.

During the year the chemicals were applied to the water at the following rates: Sulphate of alumina, maximum monthly average, 514 pounds per million gallons in February; minimum monthly average, 114 pounds in July. Lime, maximum average, 543 pounds in February. Soda ash, maximum average, 1,058 pounds per million gallons in November; minimum average 400 pounds in June. The turbidity of the river water was 10 or less during 145 days, 11 to 25 during 137 days, and was above 500 during eight days. The mean turbidity for the year was 56 and the mean color was 18.

CENTRALIZED BUYING FOR MUNICIPALITIES

Centralized buying for municipalities is recommended by the National Association of Purchasing Agents. At a recent meeting of the Legislative Committee of this organization of the nation's buyers, the following resolution was adopted:

"WHEREAS, Substantial economies are being effected by various municipalities, states, federal departments, and other governmental bureaus through a centralized purchasing department in charge of a purchasing agent, be it

"RESOLVED, That we recommend that all local associations affiliated with The National Association of Purchasing Agents take a keen interest in the movement and encourage the general establishing of such departments. Further, be it

"RESOLVED, That the local association of The National Association of Purchasing Agents use their best endeavors to have legislation framed which will permit the incumbents of such departments to perform their duties in a free and untrammeled manner, secure from political influence."

"RESOLVED, That each local association be requested by this committee to take up with the city administrations of their respective municipalities the question of encouraging a central buying division in conformity with the resolution of the Legislative Committee adopted at the meeting of the Board of Directors of The National Association of Purchasing Agents, at Pittsburgh, January 11."

Municipal Journal

Published weekly at
243 West 39th Street, New York, N. Y.
by
Municipal Journal and Engineer, Inc.

S. W. HUME, *President*
J. T. MORRIS, *Treasurer* A. PRESCOTT FOLWELL, *Secretary*

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago

Contributed Articles and Reports

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

GARBAGE DISPOSAL COSTS AND CONTRACTS.

The recent history of garbage disposal plans and bids for the city of Baltimore presents several very interesting features, among them the relative costs to the city of different methods of disposal, and the length of the contract period.

About a year ago a bid was received from a contractor who intended to treat the garbage by a reduction process and offered the city 35 cents a ton for the garbage delivered on scows at the water front. It had previously cost the city $1.06 a ton for disposal by another reduction process. At present and until May 1st, when pig feeding is to begin, the city is disposing of the garbage by burying it in shallow trenches, the cost being 85 cents a ton. Under a contract entered into last December, the city is to receive a sum (based upon the market price of hogs from month to month) estimated at about 45 cents per ton, the city to provide the water transportation to the farm, which the city estimated will cost $15,000 a year, or about 20 cents a ton. Deducting the estimated cost of this transportation, the net return to the city is therefore estimated at more than 20 cents a ton.

The most striking feature of these figures is that, whereas the city formerly paid a large sum for disposing of the garbage, it received bids last year from parties, some of whom proposed to use reduction and others to feed to pigs, under the terms of which bidds it would receive a net income. (None of these calculations or figures included cost of collecting.) This experience of Baltimore is not unique, for until a very few years ago practically every city was disposing of its garbage at a net loss, no matter what the method; while during the past five years several cities have made contracts for disposing of it at a net profit. The several costs and bids at Baltimore, however, all occurring within a year, emphasize the change in this respect that has taken place quite recently, and demonstrate that there is a value in garbage that, at least under certain conditions as to size of city and location, can be made to yield a net profit over the cost of treatment.

The lengths of contract periods proposed by the city, and which were determined upon presumably after careful consideration, also give prominence to a matter that is well known but seems to be disregarded by many city officials in asking for bids. Baltimore offered a contract for reduction for an eleven-year term, and later for a sixteen-year term; while the term for the pig-feeding contract was five years. The reason for this was, of course, a simple business one. A contractor must calculate to recover the entire cost of his plant, less any scrap value it may have, in addition to the cost of operation, and this plant cost must be recovered during the period of the contract. If the construction cost less scrap value of a plant should be $600 for each ton of daily capacity, this would amount to about $2 per ton treated if operated for one year only but to only 12 cents a ton if operated for sixteen years. Add 5 per cent. interest, and the contractor must add to his operating expenses $2.10 if he has a one-year contract, but only 22 cents under a sixteen-year contract. That is, under the one-year contract the contractor must charge the city $1.88 a ton more (or pay the city $1.88 a ton loss) than if he had a sixteen-year contract. Of course the contractor may take a chance on being able to renew the contract and reduce his price correspondingly, and undoubtedly contracts heretofore have been made with this idea in view, a contractor who has already partially paid for his plant being able to bid somewhat lower at the next letting than another who must erect an entirely new plant for the purpose.

The most advantageous period for a contract would appear to be that of the economical life of the plant. If a contract should be for twenty years and the original plant should depreciate so greatly at the end of fifteen years as to necessitate the erection of a new plant, the contractor would, for the remaining five years, be at the same disadvantage as though having to operate under a five-year contract. It would appear, therefore, that a contract period might be made too long as well as too short to secure the most favorable bid. As the life of different plants would probably vary, there are certain advantages, apparently, in asking the bidders to themselves name the duration of the contract as well as the financial terms. It was undoubtedly because of this relation between term of contract and life of plant that Baltimore did not think it necessary to make the term of the pig-feeding contract longer than five years, since the plant necessary is comparatively inexpensive, consisting chiefly of feeding platforms and shelter, and if these be made of timber, possibly five years would see many of them depreciated to the point where new construction or extensive repairs would be required. Also, in pig raising, it is easy for the contractor to sell out the entire herd on a few weeks' or months' notice at little or no loss.

In spite of the simple and undisputed argument in favor of giving a contract for a term of years where there is involved a fixed plant of considerable cost, a number of cities have persisted in letting contracts for only one or two years at a time for the disposal of garbage and other refuse or for other work requiring permanent plants. It has been a scandal for years that in one of our largest cities the officials have persisted in this practice, and in addition have generally given only a few days or weeks in which to prepare bids, and frequently only two or three months after bidding before the contract is to go into effect, allowing only this short period for the officials to decide upon the awarding of the contract and the successful bidder to erect his plant; and there is no assurance that the awarding of the contract will not be delayed during the greater part of this period if the low bidder is not favored by the officials in charge.

There are several variations in contract which may be employed to eliminate a part of this disadvantage of a short term. For inistance, the city may agree to

take over the plant from the contractor by paying the cost less a stated amount for depreciation, in which case the contractor would need to include in his price only a sum sufficient to return to him the estimated depreciation rather than the entire cost of the plant. Or the city may build the plant itself and turn it over to whatever contractor may be given the contract for the time being; or it may of course operate the plant itself. But where it is a case of a straight contract for this or any other kind of work which requires a fixed and permanent plant, it should be realized that it is possible for a contractor to make a very considerable reduction in price if he can count with certainty on a long term of years in which to recover the construction cost of his plant.

NO OPENINGS IN PENNSYLVANIA STATE ROADS.

The highway commission of Pennsylvania, Lewis S. Sadler, has recently announced that "there will be absolutely no deviation from the rule that no permanent pavement will be put down in the boroughs of Pennsylvania, so far as the State Highway department is concerned, until every pipe or sewer connection is made on the thoroughfare to be improved. This announcement is in line with Governor Sproul's determination that there shall be no waste of state highway funds." Borough authorities must agree that for at least five years after completion the pavement may not be disturbed, unless in case of extraordinary emergency; and the state will insist that such agreements be lived up to.

Commissioner Sadler believes that this policy will save the commonwealth many hundreds of thousands of dollars, and he is firm in his determination to have it carried out.

LABOR CONDITIONS IN THE UNITED STATES*

Opinions and Figures Submitted by Contractors and the Department of Labor—Effect of Immigration and Emigration.

Forty-two cities expect labor to be more plentiful this year than last, and twenty-eight of the cities give as a reason the termination of war, closing of war industries and return of soldiers. Sixteen cities report plenty of labor now and in sight. Only two cities suggest additional sources. One New York city thinks immigration should not be prohibited, and one California city suggests Mexican labor. Three cities have secured labor from state labor exchanges with good results; seven have had poor results with such labor.

Thirty-nine cities report that they will need 19,160 laborers during the season of 1919. Forty-three cities report that they will spend $46,570,613 in highway and street work this season.

Replies from Contractors: Twenty-four contracting firms, well distributed throughout the country, make replies which may be summarized as follows:

The average rate of wages they paid in 1912 was $.192; in 1913 it was $.20; in 1914, $.21; in 1915, $.23; in 1916, $.256; in 1917, $.315; in 1918, $.397. The average wage which they expect to pay in 1919 is $.38.

Sixteen contractors expect labor to be more plentiful on account of cessation of war activities and the return of soldiers. It is interesting to note that just half of these contractors suggest immigration as the source of further labor supply.

*Continued from page 209.

Nine contractors have used labor from state labor exchanges. Six report "poor" results; one reports "bad" results, and two state that results were indifferent.

Information from United States Department of Labor: In the preliminary collection of data for this report your committee ascertained that the Department of Labor, through its employment offices distributed throughout the country, was keeping a close tab on employment conditions, that reports were regularly made to Washington, assembled and published and that beginning soon after the signing of the armistice the number of cities reporting unemployment has been growing weekly. The chairman of your committee was privileged about three weeks ago to have about an hour's interview with Mr. Otto T. Mallery, executive secretary of the War Labor Policies Board of the United States Department of Labor. It was learned that this Board are rather apprehensive of a serious condition of unemployment. The director of the Board, Mr. Harold G. Moulton, had just recently delivered an address before the Union League Club of Chicago upon the subject of "Public Works or Public Charity." This address, which has been published, sets forth very concisely the problem of demobilization or equalizing the rate of flow of labor from war activities to peace activities. By a chart Mr. Moulton very clearly illustrates that the bulk of labor at the time the armistice was signed was found in the following reservoirs: Men under arms abroad, estimated to be about 2,000,000; men under arms in the United States, estimated to be about 1,600,000; workers in inconvertible industries, that is to say, munitions factories, possibly 3,000,000 or 4,000,000 of men and women. Supplementing the labor in these reservoirs will be the new immigration, which is problematical, and the natural increase of working population by way of boys reaching maturity.

From all of these sources Mr. Moulton concludes that during the next twelve months it is probable that 5,000,000 or 6,000,000 workers will seek employment in this country.

The problem, of course, is to return these workers to peace time activities in such a way as to avoid a large volume of unemployment, to maintain labor standards, to avoid serious falls in the rate of wages, to maintain production at a high level and to remove the possibility of depression.

As many of the industries which would, under peace conditions, absorb these laborers, were dismantled and refitted for war work, and as many new plants were built in the early months of the war and fitted for war work exclusively and will now have to be refitted for peace time production, it is apparent that there may be some hiatus in employment, unless perchance public works of a large volume can be provided to consume this labor during the process of transition. Mr. Moulton very properly describes this employment as buffer employment and shows by his chart that the labor upon demobilization from the war activities should flow through this buffer employment and finally be located in peace time activities.

Mr. Moulton points out that we must depend principally on public works, federal, state and city projects to absorb this surplus labor.

The War Labor Policies Board has been instrumental in having introduced in Congress a bill, known as the Kenyon bill, providing for the creation of an emergency public works commission, to be furnished with appropriations and authority and at periods of unemployment to prosecute various kinds of public works and to assist

political sub-divisions to carry on local public works by advancing the necessary funds, which would be repaid in installments. During normal times this commission would cease activities.

The State of Pennsylvania passed similar legislation about two years ago.

It is interesting to note in a recent report of Mr. Mallery, executive secretary of the War Labor Policies Board, for consideration of the members of the Public Works Commission of Pennsylvania, the following list of activities suggested for providing employment for surplus labor:

1. Highways.
2. Forestry.
3. Water conservation and control.
4. Health.
5. Public works of cities and towns.

Note that highways are placed first. The following explanatory statement is interesting: "Highway construction is particularly useful in providing employment for unskilled workers, upon whom the greatest burden of suffering falls in bad times. The geographical distribution of highway work is another element of advantage for our purpose because it will diminish unemployment in many districts at the same time."

At the conclusion of the interview with Mr. Mallery at Washington he stated to the chairman of your committee very emphatically that the road builders of the country should rest assured that plenty of common labor for all highway construction work would be available during the present season.

An interesting point that was brought out in the interview was the following: Mr. Mallery's attention was directed to the idea, which seems to be prevalent quite generally, that discharged soldiers will not want to take up the work of common laborers. He quite agreed, and stated that discharged soldiers will probably be given work as mechanics and the so-called mechanics, who have been working in munitions plants for periods of from three months to a year, will have to go back to the work which they formerly did, namely, common labor. In other words, those who have been employed in the mechanical trades during the last two years will be displaced by returning soldiers.

Press reports to the effect that the House Immigration Committee of Congress has recently reported a bill which would close against the immigrant for a period of four years the hitherto open American door furnish an illuminating view of the labor conditions as they are seen by Congress. Sponsors for and framers of the bill say it is designed to allow this county to get back to a firm industrial basis without the burden of absorbing a million or more immigrants annually and to guard against foreign political agitators attempting to infect American labor with the views of Bolshevism.

EMIGRATION.

It would hardly seem proper to close this discussion without referring briefly to the fact that many foreigners, whom we naturally think of as unskilled laborers, are leaving this country. In the New York American of February 9, 1919, is a statement that during January last 23,000 Greeks and Italians left the port of New York for the lands of their nativity. Nationals of these countries are leaving as fast as ships can carry them. The collector of the port of New York states that there are many more anxious to go home than can be transported, and thousands are on the waiting list. In the first week of February 16,000 Greeks and Italians sailed for their homes. The collector, in an interview, makes the following statement with respect to these aliens:

Most of them are of the laboring class, and during the war they have been working in munition factories, making more money than they ever made before, and saving it. With a few thousand saved, the Italian laborer's dream is to settle down in the old country, retire from active work and live in comfort.

At first blush it seemed to me that conditions in this country would be improved by the departure of so many foreigners, that for every one who sailed away there would be a job for a returning soldier. But on reflection I realized that our returning solders will not want the jobs these men are vacating.

These Italians and Greeks are laborers who have been building roads and doing the really hard work. Our soldiers have had enough of that kind of work in the trenches. And as a matter of fact, our army was composed of skilled mechanics, salesmen, clerks and mental workers, and the proportion of laborers was small. I am wondering, therefore, if this migration continues, what the United States will do for unskilled labor.

The collector's view with respect to the kind of men who have made up our army confirms Mr. Mallery's statement that soldiers will take up mechanical work and displace those who have been drawn into this line of work during the war.

TEXAS BOARD OF HEALTH REPORT.

The annual report of the Bureau of Sanitary Engineering of the Texas State Board of Health records a most commendable activity in that state along the lines of sewerage and sewage treatment, water purification, refuse disposal, and sanitation generally. More than 160 cities and towns have sewage treatment plants in operation or under construction, and this number would have been greater but for the interference of war conditions. It is admitted that, as in other states, not all of the plants are perfect, but this is attributed to the failure of the cities to have the plans passed upon by the bureau or to construct and operate them in the way recommended.

Texas is peculiarly the home of the activated sludge method, there being ten such plants in operation there, one of them being the first in the world to treat the entire sewage of a city.

The bureau has designed, for use in outlying districts where sewerage is impracticable, an incinerator closet for disposing of night soil that has given very favorable results.

Two hundred and seventy cities and towns in the state have water supply systems, 39 of them treating the water in some way, 11 by settling only, 4 by liquid chlorine, 2 by hypochlorite, 21 by filtering and one by "straining." Seventy of the works are privately owned, 199 are municipal, and one city has both private and municipal.

There are 28 incinerators in the state, two of them being connected with institutions. "Most of these plants were built at a nominal cost, and the interest on the investment and cost of destruction is less than the extra expense of long hauls to dumping grounds, which are a menace to the health of any community where they exist. The construction of efficient incinerators should be encouraged and the nuisance created by the dumping ground abated. Poorly constructed plants with high operating costs retard progress in this line of sanitation." Four of the plants are of the Decarie type, 5 of the McGuire type, one Dixon, one Nye, three were designed by the State Board of Health, and the others were of less well known make.

The municipal sewage treatment plants operating in the state number 140, of which 57 include Imhoff tanks, 55 include septic tanks, 12 plain settling tanks, and 9 activated sludge tanks. In addition there are 35 septic tanks at county institutions.

NEWS OF THE SOCIETIES

March 25, 26.—AMERICAN WATER WORKS ASSOCIATION, ILLINOIS SECTION. Eleventh annual meeting, Urbana, Ill. Secretary, G. C. Habermeyer, acting chief, State Water Survey, Urbana.

April 14-19.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Mineral Wells, Tex. Secretary, F. A. Rountree, Birmingham, Ala.

April 16-17.—AMERICAN WATER WORKS ASSOCIATION, IOWA SECTION. Fourth annual meeting, State University, Iowa City, Ia. Acting Secretary, J. H. Dunlap, State University.

April 25-26.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, Logan Hall, West Philadelphia, Pa.

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

New Jersey League of Municipalities.

Representatives from municipalities in all parts of New Jersey were present at the annual meeting of the New Jersey State League of Municipalities held at Trenton recently.

The opening session was largely taken up with the presentation and reading of reports. Mayor Seger, the retiring president, reviewed the activities of the organization and outlined the fight that the league had made against the Public Service Corporation in the rate increase for trolley service.

Mayor Seger announced the appointment of the following as a legal advisory board to give consideration to all pertinent legal matters involving the various member municipalities of the organization: Jerome T. Congleton, city counsel for Newark; Charles R. Reed, Plainfield; Albert O. Miller, Jr., Passaic; Charles E. Bird, Trenton; Francis C. Scott, Paterson, and Harry Miller, Asbury Park.

It was the sense of the league that this state's municipalities, through the league, should continue their fight against boosts in street railway fares, particularly in those instances where the cost of service has been increased, notwithstanding municipal franchise contracts providing for maximum rates for service.

Following a talk by George L. Record of Jersey City, who said he had but little faith in litigation to cure the troubles between the public and the street car companies, mayors Gillen, of Newark; Calkins, of Plainfield, and Seger, of Passaic, conferred and decided to refer to the league's executive committee for final decision the question of appealing to the United States Supreme Court either the Collingswood case decision or the general trolley fare edict. Either case, Mr. Record said, would be suitable for the purpose. He pointed out that in both the state had abrogated the contracts made between the utility corporations and the municipalities, adding: "I have advised Passaic to cancel the franchise. Jersey City has done likewise."

Mr. Record insisted that the Supreme Court of the state had read into the law something that is not in it, that never was intended to be put in it, or, if it had been in it would never have been enacted.

Continuing, he said: "Does any one realize the far-reaching effect of a decision of this kind Where do we stand in these matters? In the face of such decisions where do our rights begin and end? This is what will happen: The corporations, with their holding companies and their manipulations through them, cannot and will not give the service the people require, and must therefore turn their properties over to the public. The corporations and the public must meet and by a reasonable agreement these utilities must be turned over to the ownership of the people and by them operated as we do our schools and other public institutions. Massachusetts and other states have practically come to this. New York is rapidly coming to it and eventually they will all fall in line."

Dorsey Hyde, Jr., municipal reference librarian of New York, spoke on the fate of the five cent fare. He said that he believes the solution of trolley transportation problems lies in representation of the municipalities at the "trolley peace table." He expressed the belief that relief will eventually come either through municipal ownership or municipal control of the lines.

Legislation recommended by the lawyers' committee included a measure to enable municipalities to pay a bonus to any of its employees during the high cost of living period, a bill to bar the taking out of tax ratables any more taxable property, a bill enabling school boards to take over municipal playgrounds and empowering them to conduct complete recreation systems.

A warning as to the condition of the police and firemen's funds as well as teachers' retirement fund, was given by Assemblyman Arthur N. Pierson, chairman of the Pension and Retirement Fund Commission, authorized by the last legislature. Once more Mr. Pierson declared that all of them are insolvent and as he put it, must sooner or later break down. "Those affected by existing pensions," said Mr. Pierson, "have shown special interest in the investigation and proposals of the commission in connection with uniform pension laws. Public officials and taxpayers have seemed to be insensible to the real condition of existing pension funds, or else they shrink from taking a part in the matter for fear of incurring the disfavor of some who are members of the fund."

Membership of the league increased during the last year from 158 to 185 municipalities. Mayor Seger, of Passaic, the retiring president of the league, commended the bureau of information and research that has been established at Princeton University, and said that a similar bureau will be established at Rutgers College.

The officers elected by the league were as follows: President, mayor Leighton Calkins, of Plainfield, to succeed mayor George N. Seger, of Passaic; vice-president, mayor Charles P. Gillen, of Newark, second vice-president, mayor Louis F. Dodd, of Montclair; third vice-president, mayor Harry Bacharach, of Atlantic City; secretary, Homer Talbot, former secretary of the Kansas City League of Municipalities; treasurer, Clinton J. Schwartz, tax receiver of Trenton.

The executive committee named by president Calkins consists of the following: mayor Frederick W. Donnelly, Trenton; commissioner Raymond, Newark; mayor Frank Hague, Jersey City; mayor Daniel J. Garber, Ridgewood; mayor C. E. F. Hetrick, Asbury Park; mayor Thomas W. Jack, Collingswood; mayor Frank Dorsey, Perth Amboy; mayor Washington Wilson, Metuchen; mayor Victor Mravlag, Elizabeth; mayor Emil Diebitsch, Nutley; mayor David H. Slaybach, Verona, and mayor J. P. Potter, Clayton.

PERSONALS

Harrison, B. Powell, has been appointed harbor engineer of Baltimore, Md. Mr. Harrison is a graduate of the Virginia Military Institute. He was employed on the Panama Canal for three years, and acted in various engineering capacities for the Baltimore and Ohio Railroad. He was engaged on the filtration plant at Washington for two years and was engineer in charge of dredging and survey work on Patapsco River and Chesapeake Bay for four years, or until 1912. Since then he has been division engineer, second assistant engineer and first engineer of the State Roads Commission until the present appointment. He is a member of the American Society of Civil Engineers.

Jarvis, Frank, has been appointed commissioner of safety of White Plains, N. Y., by the common council.

Reynolds, Major Myron B., who was recently released from his command of the 208th Engineer Sappers, 18th Division, Camp Travis, Texas, has been appointed acting assistant city engineer of Chicago, succeeding Henry W. Clausen, who resigned January 1 to enter private business. Major Reynolds was engineer of water-works design in Chicago for four years previous to his entry into Government service in September, 1917. He was with the city engineering department for thirteen years.

Municipal Journal and Public Works

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York

S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI **NEW YORK, MARCH 29, 1919** **No. 13**

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Municipal Journal and Public Works..... 227
Give Them Jobs As Well As Honors..... 227
The Construction Prospect 228
Grand Haven's Municipal Utilities..... 228
Waste Paper Reports 228
Truck Transportation of Laborers and Materials. By W. E. Hardenburg 229
Code Letters as Highway Reports..... 230
Anaheim's Sprinkler Truck (Illustrated)..... 230
Obtaining Sewage For Experiment Stations..... 231
Sewerage of Leominster, Mass., (Illustrated)..... 232
Snow Survey of Watersheds (Illustrated)..... 234
Wrapping Garbage 236
Cost Keeping for Highway Contractors. By Halbert P. Gillette.. 236
Inclined Viaduct for Pedestrians (Illustrated)..... 238
The Week's News 239
News of the Societies..... 243
Problems Cities Are Studying with Experts..... 243
Personals 243
New Appliances (Illustrated)..... 244
Industrial News 244
Contract News 19

MUNICIPAL JOURNAL AND PUBLIC WORKS.
City, County and State.

With this issue the name of Municipal Journal is changed by the addition of the words and Public Works. The change in name does not mean any change in policy, however. We shall continue to put editorial accent on municipal improvements and endeavor to make the paper more than ever valuable to engineers, heads of all municipal departments, and contractors in connection with the constructing and operating of municipal and other public works and utilities.

The chief aim in making the change in name is to indicate to those who are not familiar with the paper that it is not chiefly a "journal" of municipal happenings and doings, but that it gives special prominence to public works, and to those of county and state as well as of city. In the broad and dictionary definition of "municipal," that word covers all these, but in the popular mind it has come to be limited to city only.

As in the past, we ask the advice and cooperation of all who are interested directly in public works and utilities, to the end that this may continue to be the paper to which they may turn for information and help.

GIVE THEM JOBS AS WELL AS HONORS.

For several months we have been urging that each city in the country undertake to find positions for its own citizens among the returning soldiers and sailors, and that announcement to this effect be made to the boys before or as soon as they reach this country. The federal agents, and especially the Employment Service of the Department of Labor, adopted the idea and made similar request of all cities. This has been supplemented by the direct placing of thousands of the discharged men by the Employment Service itself. But owing to the failure of Congress to make any appropriation for the continuance of the work of this bureau, it has become more than ever necessary for the cities to take immediate and practical steps for the carrying on of the work. Advice and cooperation will be furnished by a committee of the National Chamber of Commerce with headquarters at Washington.

The boys were certainly "on the job" over there. See that they get promptly on a job over here.

THE CONSTRUCTION PROSPECT.

The U. S. Department of Labor reports that a nation-wide inquiry reveals projected work totaling in value about $1,709,000,000. More than thirty per cent of this is in the three states, Illinois, New York and Ohio, but every state but one reports more than a million dollars' worth. It is interesting to note that nearly three-fourths of the total estimated cost is for public works, although the number of public projects constitute only 54 per cent. of the total. The average cost of each private project is about $153,000 (one of them, Chicago's railroad terminal, is for $60,000,000), while the average for public projects is about $387,300. These figures indicate the important part that public works are to play in this adjustment period.

GRAND HAVEN'S MUNICIPAL UTILITIES.

The financial statement of the city of Grand Haven, Michigan, audited by the Michigan Trust Company, has been sent to us by city manager I. R. Ellison, and the figures certainly warrant the pride that he takes in them.

During the past three years, since the manager form of government went into effect, the tax rate has decreased although the valuation has remained practically constant. The bonded indebtedness has been diminished, however; compared to which, the city had issued refunding bonds on four separate occasions in previous years because of inability to meet its obligations then due.

The electric light plant showed a net profit, after setting aside $8,614.57 for the depreciation fund, of $8,380.48, in spite of the fact that the cost of operating during 1918 was about $18,000 above normal, owing to high price of coal and labor. The rates charged for current were 9 cts. per kw. h. for general lighting, 10 per cent discount for prompt payment; commercial lighting rate, $2.50 per month per kw. of maximum demand; power, demand charge, 60 cts. per month per active h. p. connected, and 1.7 cts. per kw. h. for energy. The entire plant has been rebuilt during the past three years without a bond issue.

The water works have generally shown a deficit, that in 1917 being $2,500; but last year there was a net profit of $667.16 after setting aside $4,533 for the depreciation fund. The water rates have not been changed during the past three years.

WASTE PAPER REPORTS.

An annual report of a water board has reached us which contains seventy pages, sixty-eight of which are waste paper, for all of the information concerning the year's operation that is given, that it is desirable to include, could be printed on two pages. The report contains:

List of all mains and fire hydrants in system....	12	pages
Rules (adopted 8 years ago).....	8	"
Itemized accounts (includes every 25c. and 30c. item)	17	"
Rates (could have been put on one page).....	2	"
Description of plant (could be put on one page)..	2	"
Photographs of features of plants 4 to 20 yrs. old	8	"
Brief notes facing photographs.....	8	"
Personnel of the board.....	1	"
"Order of Business" of its meetings.....	1	"
Blank	11	"
Total	70	"

And with it all, not a word describing what the board did during the year, except the figures of receipts and expenditures. The rest could be, and probably is, used in the reports year after year.

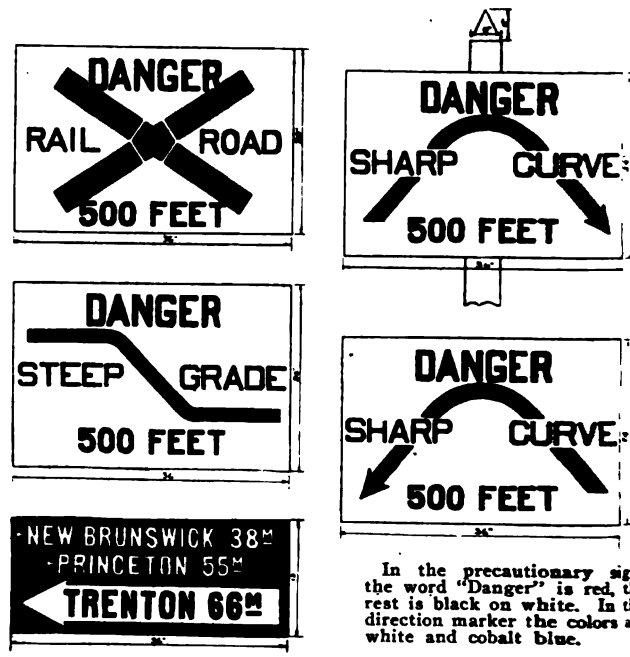
Such a report would be read by the average taxpayer with the same avidity and interest, but not half the information, as an unabridged dictionary. It is almost entirely useless and wasteful of money. The few facts given that were worth giving are so buried in a mass of antique or insignificant matter that the average citizen would never discover them.

This is an extreme illustration of what is found in too many municipal reports. If we should judge the conduct of municipal plants by the lack of intelligence and ability shown in reports such as these, the occasional failure of municipal ownership is easily accounted for. Fortunately, most municipal officials prepare reports from which the citizens of average intelligence can obtain a clear and full idea of what their departments have done during the year. But taxpayers who have imposed upon them such padded volumes of non-information as the above should protest against the failure of their officials to give them the information concerning their plants to which they are entitled, and against the waste of the city's money in printing such quantities of unnecessary matter.

UNIFORM HIGHWAY SIGNS.

Already Adopted by Five States—Modifications of Connecticut and New Jersey Signs Recommended for Country-Wide Adoption.

The idea of having uniform highway signs, both direction markers and precautionary signs, throughout the country was advocated by a committee of the American Roader Builders' Association at its recent convention. The committee consisted of R. A. Meeker, T. J. Wasser and J. L. Bauer. The committee reported that five states have adopted standard signs, these being Connecticut, Massachusetts, New Jersey, New York and Pennsylvania. A committee of the New Jersey Association of County Engineers had recommended that the sign adopted for Connecticut be made the standard for New Jersey also with certain modifications; and the



In the precautionary sign the word "Danger" is red, the rest is black on white. In the direction marker the colors are white and cobalt blue.

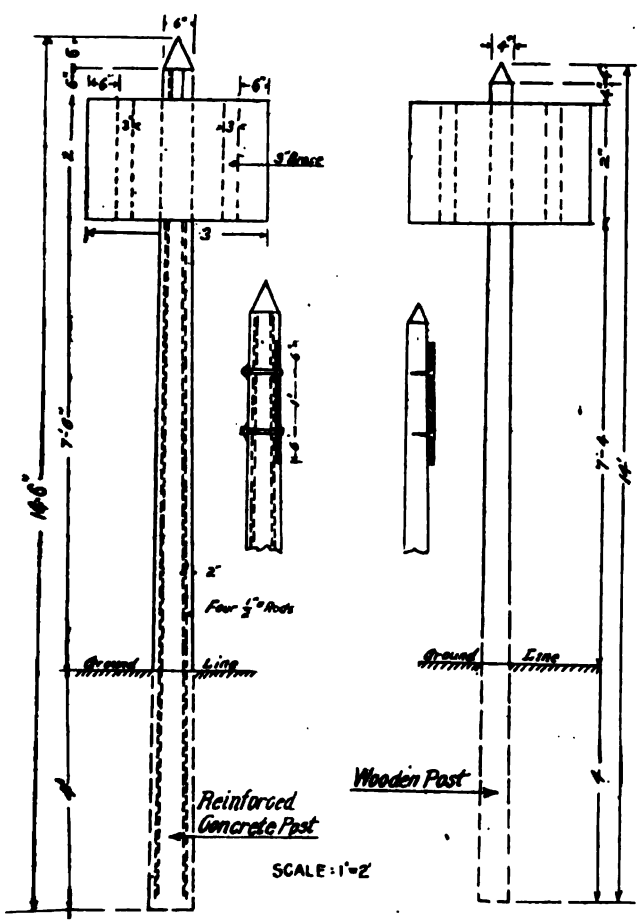
ROAD SIGNS RECOMMENDED FOR NEW JERSEY STATE AND COUNTY HIGHWAYS BY N. J. ASSOCIATION OF COUNTY ENGINEERS.

committee of the Road Builders' Association in turn recommends that this same sign be used, as a basis at least, for a national standard.

The standards as adopted for New Jersey are shown on the accompanying illustration. The most prominent feature of this is the use of the arrow in both direction and precautionary signs. In the direction marker the name of the most important town on the route is shown conspicuously within the arrow, and two intermediate towns are named less conspicuously on the sign. This marker is to be 15 inches high and 36 inches wide and constructed of wood or metal. Smaller arrows are shown in front of the names of the two towns or cities above the main arrow. The Road Builders' committee recommends that there be added to this sign the words "This is ——," giving the name of the town in which the sign is placed; also that the arrow shall be cobalt blue.

The precautionary signs as adopted for New Jersey differ from the Connecticut sign in that, where the New Jersey sign gives the distance in feet to the danger point (which is to be 500 feet wherever possible), the Connecticut sign has the word "ahead." Where the sign denotes a dangerous curve, this is indicated by a curved arrow, the head of the arrow on the left indicating that the curve turns to the left and vice versa. The Road Builders' committee would add to this description that the word "danger" on the precautionary signs shall be in vermillion and all other parts of the sign in either black or white. It also recommends that these signs be used only in the open country.

The chief argument for adopting standard signs is that, with the great increase in variety and number of private signs, it is difficult for the automobilist to locate quickly the sign of the highway department which gives him the information or the caution for which he is on the lookout, unless he knows exactly what shape, color, etc., to look for. A great deal will, of course, be accomplished when a standard is adopted for all of the signs in any one state; but there is now so much touring that embraces a great number of states, that the benefit will be increased by adopting a standard that will be used by all of them. It will, of course, be necessary to prohibit by law the use by private parties, for advertising purposes, of signs that bear anything like a close resemblance to these standard signs.



SIGN POSTS RECOMMENDED FOR NEW JERSEY HIGHWAYS.

TRUCK TRANSPORTATION OF LABORERS AND MATERIALS.

Results and Costs on Work Done by Federal Health Authorities at Macon, Georgia.

By W. E. HARDENBURG.

Transportation of laborers and materials by trucks was found to be considerably cheaper than transportation by rail on a large drainage and construction job at Macon, Ga., completed last fall under the auspices of the city of Macon, Bibb County, Georgia, and federal health authorities.

From January 1 to November 15, approximately $3,825 was spent on truck transportation, of which $510 represented hire of trucks used in addition to those owned and operated by the city of Macon, the county and the government. The balance $3,315, represented the costs of upkeep and operation of two trucks for seven months and two more trucks, for five months, or, let us say, of two trucks for twelve months. On this basis, the monthly cost of operation of the two trucks was $276, or per truck $138.

Of the total of $3,315 spent on the trucks, wages of the truck drivers represented $1,560; gasoline and oil, $830, and repairs, $925. Of the monthly cost per truck, $138, wages took $65; gasoline and oil, $35, and repairs, $38.

It is believed that 25 miles per day would be a very conservative estimate of the average daily run of each truck. This would be a monthly mileage of $650 per truck.

From these figures, not allowing for depreciation, the average cost of operation per mile was 21 cents. Dividing this into its component parts it was found that wages amounted to 10 cents per mile; gasoline and oil, 5.3 cents, and repairs, 5.8 cents.

A comparison of truck and rail costs of transportating laborers to and from their work was made. It was found that to carry one laborer to and from his work—an average distance of five miles—the cost by rail was 30 cents per day. As each truck would carry 20 or more laborers to and from their work in approximately half an hour and as the total daily cost of truck operation was only $5.31, based on a ten-hour day, it resulted that each laborer was carried for 2.65 cents daily.

On one portion of the job, laborers at first were sent to their work—a distance of about two miles—on street cars at a cost of 12 cents per laborer per day. Later, these laborers were carried to their work in one of the trucks at a cost of about 1 cent per laborer per day.

Another advantage of the trucks in this connection was the fact that the trucks generally were able to convey the laborers to the exact spot at which they were to work, while trains generally left them at a point several minutes' walk from the job.

It was possible most of the time to keep the trucks busy the rest of the day hauling materials, dynamite, mosquito oil, etc., and transporting foremen and inspectors from one part of the job to another. Even though it had been impossible to utilize the trucks for anything else, the figures indicate that it would have paid to keep them for the transportation of laborers alone, as transportation of 20 men by rail would have cost $6.00 daily as against the $5.31 that it cost to run the trucks; and this cost would have been less had no other work been done.

While, on a mileage basis, rail transportation of materials was somewhat cheaper as a rule than transportation by trucks, the fact that the trucks obviated the delays consequent on rail transportation, and also took the materials much nearer to their ultimate objective, effected economies in time which more than counterbalanced the cheaper rail rate per mile.

The trucks in question were one-ton Ford trucks which cost about $800 each. Considering the very difficult terrain in which they were operated—swamps, rough plantation trails and sand beds—it is believed they did fairly well.

Unquestionably, costs would have been greatly reduced had it been possible to obtain qualified drivers. As it was, inexperienced and unreliable men, mostly negroes, were employed for this work. These persons would experiment with the machines, run them too fast and fail periodically to report for duty, entailing a big truck-driver turnover. It is believed that repair costs would have been halved had qualified men been running the trucks.

CODE LETTERS AS HIGHWAY REPORTS.

We have received from the Texas State Highway Department the following letter:

March 8, 1919.

TO THE STATE HIGHWAY COMMISSION.

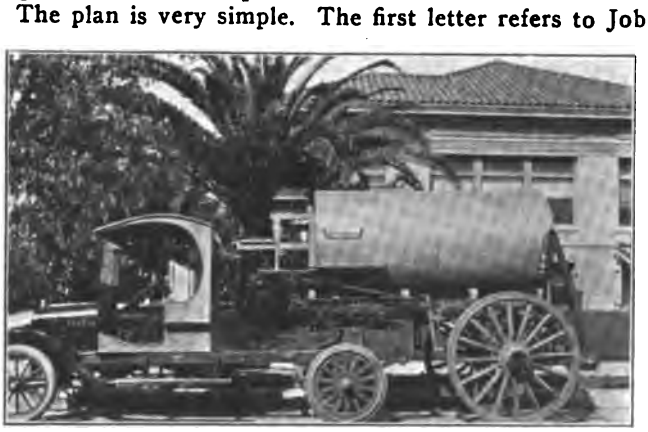
This is a code letter sent by George A. Duren, state highway engineer, for giving in condensed space information concerning the status of each highway job at the date of the report. As there are 389 jobs, it is evident that to give even a few words about each would require much more space than this.

The plan is very simple. The first letter refers to Job No. 1, the second to Job No. 2, etc. Fifty jobs are refered to on each line. The number at the left of each line is that of the first job referred to in that line, and the number at the right, the number of the last job on that line; these being given to facilitate the locating of jobs. The letter itself gives the information, by reference to the key below:

A—Application incomplete.
B—Application complete.
C—Plans received; application incomplete.
D—Plans received, application complete.
E—Plans returned for correction.
F—Revised plans received.
G—Plans approved.
H—Federal Aid Plans forwarded.
I—Federal Aid Plans returned for revision.
J—Revised Federal Aid Plans forwarded.
K—Federal Aid Plans approved.
L—Letting advertised.
M—Bids rejected.
N—Contract awarded.
O—Contract executed.
P—State Project Agreement executed.
Q—Federal Project Agreement executed.
R—Work started.
S—Work suspended.
T—Work renewed.
U—Work complete.
V—Work accepted.
W—Final estimate paid.
X—Final reimbursement received by Federal Government.
Y—Project suspended or dead.
Z—Spacer or filler or County Road Map.

To illustrate: Job No. 1 has the letter R meaning work has started on it. Job No. 2—A, application incomplete. Job No. 61—P, state project agreement executed. Job 361—N, contract awarded. The above key

1	RARHLRRALQ	RRQRRVLRYW	RRMNYNRYRY	BARAAAAEER	AHHYYRYBBR	50
51	AYYHVRNLHR	PGARALLAFY	YAABAGARLY	AYAARBIAEB	YNFAAABBBA	100
101	NAHEBAARAA	ARBAAAMAAR	LAAAAYYAAR	BAARBAAAAA	AHMBARARLO	150
151	QKGAAGARNB	BAAARRABAA	AHRABAAAAA	AAAARARAAA	AAAAAAAHBG	200
201	AGQAAABPZR	RNBAACAABA	BAZZBAAHWO	ZAACRNAAAA	AAAAZZZZAA	250
251	NAAAAALNHZ	YBAAABAADB	ABANANAAAA	ZAAAAAAARA	AARNRAAAAA	300
301	AAAARARAAA	AAAAEHAARG	BAAAACACAB	AAAAAAAAAM	BRNCABAAGA	350
351	AAAAAAEDAA	NAAAAAYAAA	AAAAAAAAAA	BBAAAAAAA		400



ANAHEIM'S SPRINKLER TRUCK.

ANAHEIM'S SPRINKLER TRUCK.

Five or six months ago the city of Anaheim, California, began using the sprinkler shown in the accompanying illustration. The equipment consists of a 2-ton Ford truck and an ordinary sprinkler wagon attached to it with a fifth wheel and pillow block. The lower half of the fifth wheel was fastened near the rear of the truck, and by removing the front truck of the sprinkler wagon and placing the upper half of the fifth wheel on the lower half, a six-wheel apparatus is obtained which is easily handled and has been found to be very efficient by the city engineer and superintendent of streets, O. E. Steward, to whom we are indebted for this information and photograph.

When the sprinkler is not in use, the front end of the wagon is jacked up, the king bolt removed, and the truck is ready for use as a truck, as the lower half of the fifth wheel does not interfere with the placing of the body on the truck.

The truck is equipped with an internal gear drive, a Torbenson axle, and a Moore auxiliary transmission. This equipment gives ample power and a great variety of speeds. When sprinkling, the apparatus is driven at a speed of about 3½ to 4 miles per hour. The sprinkler heads can be opened to give sufficient water for greater speed if desired. When traveling empty, or full to the street for sprinkling, the speed is 10 to 15 miles per hour.

Mr. Steward finds that this equipment delivers upon the street twice the quantity of water that the same driver was able to place by the use of a good horse-drawn sprinkler. If for any reason a horse-drawn sprinkler is desired, a few minutes' work places the front trucks on the wagon and it is ready for that work.

The sprinkler heads are opened by handles placed conveniently just back of the rear opening in the truck cab.

This apparatus complete, truck, truck body, and sprinkler wagon, cost the city of Anaheim about $1,900.

OBTAINING SEWAGE FOR EXPERIMENT STATIONS.

Removing It from Sewer by Bucket Elevator so as to Secure Characteristic Suspended Matter Content—Removing Grit.

In the issues of this paper for October 12, 19 and 26, 1918, we published a description of the experiments made in New Haven on the treatment of sewage by the Miles acid process, as written by Prof. C. E. A. Winslow, the chairman of the committee, which had the matter in charge. The complete report of the committee has been made public, and contains a number of other points of interest. One of these is the method of obtaining the sewage that was used in the tests, which is described in the report as follows:

Bucket Elevator. In most stations with which we are familiar, the sewage for experimental purposes has been withdrawn from the sewer by pumping. Such a procedure is unsatisfactory, however, particularly for studies which include screening, since it is difficult to obtain a fair and normal representation of the actual sewage flow by the use of a small pump. The surface solids containing floating material and grease are not fairly represented and the suspended matter is broken up so as to make screening investigations unreliable. It was finally concluded that a bucket elevator would be the most satisfactory form of apparatus for obtaining a representative and unaltered sewage for experimental purposes.

An elevator such as we desired could not be purchased ready made, but the various parts were finally obtained from several manufacturers and the structure assembled. In order to form a proper base for the elevator, the invert of the sewer was extended out to one side, in the form of a flat slab of reinforced concrete 12 inches thick, 6 feet wide and 10 feet long. This slab rested on the piles which supported the sewer. A masonry wall was built up around the edge of this slab, forming a water-tight forebay at one side of the sewer. The elevator was erected in this forebay, and after the elevator was complete two openings were cut from the forebay into the side of the sewer. These openings were each three feet wide and extended down to the invert of the sewer. A galvanized iron deflector built out from the lower side of the upper opening nearly to the center line of the sewer deflected a large fraction of the sewage flow into the forebay through the upstream opening, the sewage passing out of the forebay back into the sewer through the lower opening. The level of the sewage in the forebay, like that in the sewer itself, would rise and fall with the tide, but the composition of the sewage was not materially changed.

The elevator was built on a heavy frame of 6 by 8-inch timbers 8 feet long by 5 feet wide. The chains were in parallel, with the buckets fastened to them at every sixth link. The chains passed over two sets of sprocket wheels at the top and one set at the bottom. The larger sprocket wheel at the top, 24 inches in diameter, with 19 teeth, was on the same shaft with a large 60-inch gear with 125 teeth, which in turn was driven by a pinion 6 inches in diameter, with 12 teeth. The pinion was mounted on the same shaft with a pulley 38 inches in diameter, with 4-inch face, which was belt-driven from a 5-horse-power motor with a 4-inch pulley. The motor ran at 1730 revolutions per minute, the pinion at 182, the large gear at 17.4. As a bucket was fastened to each sixth link, and the drive sprocket had 19 teeth and ran at a rate of 17.4 r.p.m., the number of buckets discharging per minute was 55. There were in all 18 buckets on the chain. Each bucket had a total capacity of 2.64 gallons, but by the time the sewage was discharged 20 per cent had been lost by splashing, so that 55x2.64x80=116 gallons per minute or 167,000 gallons per day, represents the amount actually delivered by the elevator. The buckets were submerged to within 3 inches of the bottom of the forebay, and rose vertically through the current of sewage. The bottom of the forebay was at elevation —3.6 and the buckets discharged at elevation +13.9, giving a lift of 17.5 feet. The buckets discharged the sewage into a galvanized iron hopper suspended between the two upper sprocket shafts. From this hopper the sewage flowed by a wooden flume to the plant.

On the whole the operation of the bucket elevator proved very satisfactory. Some difficulty was experienced when stones lodged under the buckets and knocked the chains off the lower sprockets; and during the first severe cold weather the spray froze solidly around the upper part of the structure, putting the apparatus out of commission for several days. After this the entire structure was boarded up, and the warmth of the sewage proved sufficient to prevent freezing. A great deal of trouble was caused by wet belts, but as it was impossible to avoid this difficulty without changing the location of the motor and lengthening the shafting, new belts were used as soon as the previous ones had been weakened by moisture. The sewage was not churned violently by this apparatus and a very representative sample was obtained. Oil, paper and feces were brought up and discharged in about the same condition and amount as in the flowing sewage. The cost of operating this elevator was much greater than the cost of operating a centrifugal pump would have been, but since the work was experimental, it was considered that a representative sample of sewage was more essential than economical operation.

Grit Chamber. The sewage flowed from the top of the elevator to the station through a wooden flume six inches wide by six inches deep, with a slope of 1 to 100. Before reaching the distribution box it passed through a grit chamber. This grit chamber had two compartments, which could be used alternately. Each com-

partment was 15 feet long, 12 inches deep at the inlet end, 4 inches deep at the outlet end, and 4 inches wide, which gave a detention period of 0.24 minute. The velocity of the sewage was checked to 0.7 foot per second at the inlet end, increasing to 2.1 feet per second at the outlet end. When much storm water was mixed with the sanitary sewage, this grit chamber proved inadequate, so that supplementary grit chambers were installed for the sewage delivered to the activated sludge and Miles acid tanks. Our experience with this first grit chamber proved that where the combined system of sewage is in use it is very essential to have reserve grit chambers which can be used when storm water sewage is being treated. Unless ample grit chamber space is available, the settling basins will receive a great deal of inert mineral matter, which will lower the value of the sludge in processes where sludge recovery is an essential step.

Weir Box. The usual method of measuring the sewage used in experimental work is by means of orifices. In our experiments it was obvious that this method would not be satisfactory, since large particles of suspended solids would quickly clog the small orifices necessary, and, if constant head were maintained by an overflow, the floating matter would be carried over the waste weir and would not be drawn into the currents of sewage passing through the submerged orifices. Movable weirs were therefore used instead of orifices, and; after the weirs were adjusted to the quantity of sewage required for each process, a constant head of sewage was maintained over them by an automatic head-regulating device. Since some experiments required as little as 10,000 gallons per day or 7 gallons per minute, we used for these processes 60° V-notch weirs, so as to obtain a greater width of crest for a given discharge than could be obtained with a rectangular weir. This was desirable, in order that the weir might not be frequently clogged by paper or feces.

The head regulating device consisted of a float in the weir box, with a vertical spindle at its center which operated a needle valve. This needle valve controlled the flow of city water to a small brass cylinder, in which was a piston which opened and closed a butterfly-valve in the raw sewage flume. As the level of sewage dropped in the weir box the butterfly-valve was opened by the piston, and as the level increased the valve was closed. After proper adjustment, and with some attention, this apparatus, constructed by Wallace and Tiernan of New York, maintained the head of sewage in the weir box constant within one-sixteenth of an inch.

The weir box was 27 inches square by 8 inches deep. The weirs were all attached to a weir plate at one end of the box. Three 60° V-notch weirs were used for the Imhoff, activated sludge and Miles acid processes, and one rectangular weir, 7½ inches wide, for the screening influent. All weirs were calibrated by volumetric tests.

SEWERAGE OF LEOMINSTER, MASS.

Treatment in Tanks with Some Novel Features, Followed by Sprinkling Filters—One of Four Units Designed for City of Twenty Thousand Population—No Sludge After Ten Months' Operation.

Leominster, Massachusetts, became a city in the year 1915, when the population was about 18,000. Since then it has grown to approximately 20,000 population. It occupies an area of about 15 sq. miles, but only a small part of this is thickly built up. There are altogether something over 100 miles of streets and roads within the city limits, but the 31 miles of sewers which have been built reach a majority of the population. Three small streams and the Nashua river, into which these sewers discharge, pass through the town, and about fifteen dams on these various streams are used to furnish power for manufacturing plants. The sewers discharge into these streams at a number of points.

Several years ago the State Board of Health called upon the city to treat the sewage so as to reduce the pollution of the streams, and after considering two or three plans for sewage treatment, the City Council in 1917 authorized a contract for a sewage treatment plant on the Starr system, to treat the sewage of one section of the city, to have a capacity for 4,000 population. Preliminary studies had been made, and the decision reached that it would be cheaper to install four plants at different points in the city and bring the sewage from the various outlets to these than it would be to concentrate all of the sewage at one plant. Construction of this one plant was begun in the fall of 1917, and continued through the severe winter of 1917-18, and the plant was put into operation in May, 1918.

The plant was designed by Oliver F. Starr (who is now sanitary engineer on the staff of Ford, Bacon & Davis, engineers) and consists of two units built in duplicate, each consisting of a culture tank, a reduction tank, a siphon tank, a siphon chamber, and a sprinkling filter. The sewage enters the culture tank at one end, passes under a baffle wall that extends from the roof to about mid-depth of the tank, and leaves the tank by passing under another baffle wall and through an outlet pipe. This effluent passes through a smaller reduction tank, where it passes under a suspended baffle and over a second baffle rising from the bottom to near the surface of the liquid, and passes out through a slightly submerged outlet pipe. The liquid then flows through the siphon tank, which is filled with pieces of stone of about 4 to 8 inches in diameter, then passes through the open joints of a brick wall into the siphon chamber, from which the siphon discharges the effluent intermittently upon the sprinkling filter bed.

Each of the two sprinkling filter beds is about 70x110 feet, and contains 117 nozzles, placed 8 feet apart. From the sprinkling filter the effluent passes directly to the river.

Each culture tank has a hopper bottom, with an outlet from the low point into a sludge pipe controlled by a valve, the stem of which extends through the roof of the tank. Each reduction tank has a bottom divided into two hoppers, the low point of each of which is connected to the sludge pipe. The whole tank is constructed of concrete, and is entirely roofed over with a concrete slab in which several manholes are placed.

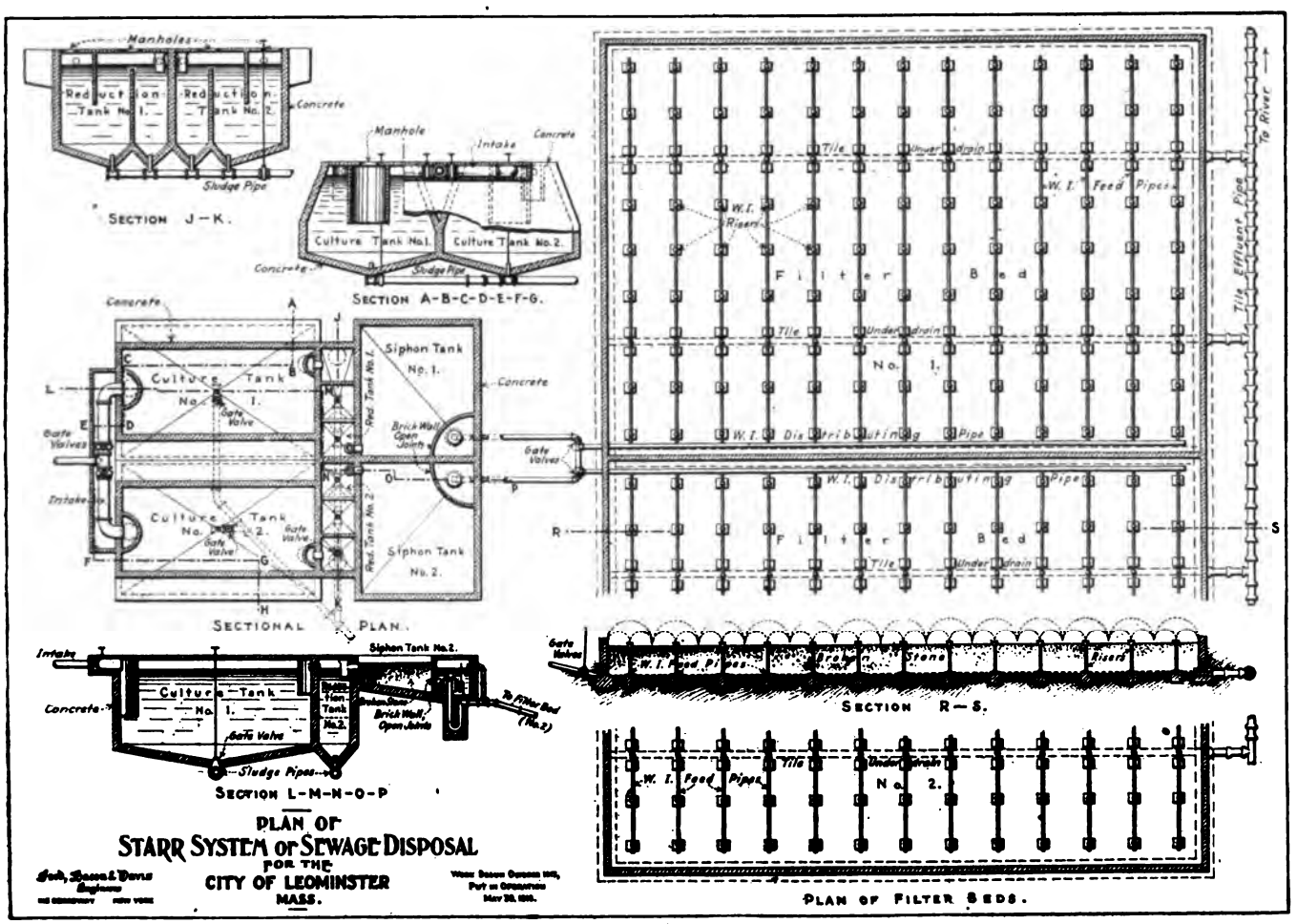
The tanks were constructed at the foot of a bank of fine sand and gravel, and the excavation for the tanks, which are 19 ft. deep at their deepest point, extended into running sand and water, which gave considerable trouble, especially on account of the extremely cold weather, during which pumping had to be continuous night and day. Although the concrete work was done during very cold weather, continuously below freezing and often below zero for days at a time, all of it which

can be seen is in excellent condition, reflecting great credit on those who had charge of the work. Careful examination revealed no places in the concrete which showed any evidence of freezing, or where the surface of the concrete was not in perfect condition.

The plant is located on a farm which had been bought several years before, when it first became evident that sewage treatment would be necessary, and now the previous owner rents the farm from the city. When the plant was completed an arrangement was made with this previous owner, and he now receives $10 per month to look out for the plant for the city. His duties consist of a daily visit and an infrequent cleaning of a sprinkler nozzle. This is the entire cost of operation of the plant. On two or three occasions the valves of the sludge pipes have been opened, but there was no indication of any accumulated sludge, only clear sewage being discharged. Mr. Starr, the designer, states that no sludge will collect in these tanks other than fine sand or grit brought down by the sewers.

Only about 1,000 people are at the present connected with this plant, and but one-half of it is in use. In fact, although both tanks were completed, the stone has not been placed in one of the two sprinkling filters. Either tank can discharge into either filter, and from May until about the first of October the north tank was used, discharging onto the south filter. At this time the flow was changed over into the south tank, as this gave a little more head on the filter. There was then about two feet of scum on the north tank. When the change in tanks was made, the sewage and scum were left standing in the tank then used. When visited by the writer on March 14, the scum had almost entirely disappeared, there being only about an inch of floating, non-cohesive matter, on the surface. On the south tank, which has been in use five or six months, there was

GENERAL VIEW OF PLANT.
Top of tanks in foreground, sprinkling filters in background.



PLAN OF LEOMINSTER SEWAGE TANKS AND SPRINKLING FILTERS.

perhaps a foot of rather soft scum. As already stated, there was apparently no sediment in the tank.

The sprinkling filters are provided with Gault nozzles. It was found that there was not sufficient sewage to operate one sprinkling filter for any considerable part of the time, the nozzle discharge occurring about once in fifty minutes and lasting for only about four or five minutes. The infrequency of discharge caused some apprehension on the part of the city officials, who, having in mind the intensely severe weather of the previous winter and fearing that this would result in the freezing of the undischarged effluent in the top of the riser pipes between discharges, caused a hole about one quarter-inch in diameter to be tapped into each riser pipe, about two feet below the filter surface, in order to drain the riser down to that level after each discharge. It seems to the writer that this was a mistake, for a considerable amount of sewage must escape through these openings while the nozzle is discharging, the effect being to both reduce the head on the nozzle and to permit the escaping sewage to follow down the outside of the riser pipe to the bottom of the bed, thus receiving no beneficial action from the filter. Probably because of these holes, the spray does not at present cover the entire filter, but owing to the small amount of sewage this is not a serious matter.

SPRINKLING FILTERS IN WINTER.

Snow is seen on the finished filter; the riser pipes of the unfinished filter are seen beyond. At the left is the sand bank into which the plant extends, and a low board fence around the filter bed to prevent sand blowing onto the filter.

Owing to the small size of the city and of the plant, no chemist has been employed to look after it. A sample of the effluent was sent a short time ago to the city chemist of Boston, but unfortunately the container was broken in transit. On March 9th, samples were taken once an hour for 24 hours, and the composite sample was analyzed by the chemist of the sewage disposal plant at Fitchburg, about 5 miles away. This analysis, in parts per million, is as follows:

Albuminoid ammonia—total	1.000
" " dissolved	0.900
" " suspended	0.100
Nitrites	0.955
Nitrates	0.000
Chlorine	29.2
Oxygen consumed—total	118.0
" " dissolved	79.0
" " suspended	39.0
Residue on Evaporation—total	260
" " " volatile	130
" " " fixed	130
Dissolved solids—total	242
" " volatile	122
" " fixed	120
Suspended " total	18
" " volatile	8
" " fixed	10

At the time of his visit the writer could detect no odor from the tanks, even when the manhole covers were removed, and that from the filter when sprinkling was hardly perceptible when standing at the lee edge of the filter bed, and no complaint has been made by residents living a short distance away. Absence of odor, low cost of installation, and nominal cost of maintenance were referred to appreciatively by the mayor, Henry F. Sawtelle, and the city has taken up with the engineers the matter of design of the other units upon the same system, and expects to proceed with construction as soon as price conditions become favorable.

SNOW SURVEYS OF WATER SHEDS

Methods Used by State Department of Engineering of California.

In the northern sections of the country a very considerable part of the run-off from catchment areas comes from the thawing of snow, and the volume of the spring freshets is limited and to a certain extent determined by the amount of snow lying on the ground when the spring rains come. The intensity and duration of individual rains, the depth of frost in the ground, air temperature at the time, etc., all have their effect upon the freshet volume, but in general the freshets will be light if there is little snow lying on the ground.

Determination of the depth and saturation of snow on the catchment area is desirable as giving a basis for forecasting freshets, and for other purposes also. For instance, if a waterworks reservoir is low but there is abundance of snow, it is not nearly so necessary to limit consumption and conserve the supply as it would be if there were only a light accumulation of snow on the area. Snow surveys are made regularly by several waterworks superintendents, the results obtained at Salt Lake City having been described by Municipal Journal in the issue of November 26, 1914.

The state Department of Engineering of California makes such surveys in a most thorough and systematic manner; and though they are made with reference to irrigation, the procedure is the same as though for municipal water supply. A description of the methods and appliances used is given in the annual report of the department, which description, together with a discussion of the value of the survey, is given herewith.

The Department of Engineering in co-operation with agencies of the federal government, is measuring the quantity of water flowing in the streams at all times, and conducting research into the uses of water. It is known now with a fair degree of accuracy the average quantity of water discharged by the principal streams of the state every year, as well as the maximum volume of flood waters that are likely to be produced at any one time.

It is contemplated that ultimately reservoirs will be built in the mountains to retain a portion of the floods, so as to reduce the quantity to be cared for by the flood-control works in the valleys. This same water will then be used for irrigation and other purposes.

But it will be necessary to know beforehand when to begin filling the reservoirs. If they should be filled with early flow of water before it has reached flood stage, and then a flood came, there will be no place to store any of it. On the other hand, if they are held empty until flood danger is past, there may not then be enough to supply the needs of irrigators and other users.

Every artificial reservoir is accurately measured and gages show every day the quantity of water they contain, but nothing is known of the quantity back of them which is yet to come. The source of all floods and of the major part of the late-season flow is the vast snow fields about the heads of the streams.

The department holds, and has so pointed out in previous reports, that surveys of these great snow-field reservoirs should be made and the water content ascertained. From the information obtained, a forecast can be made of the quantity of water that will come down when the snow melts. Such information will be valuable, not alone in directing the operation of filling artificial reservoirs, but in giving foreknowledge of the summer flow, so that the farmer may conduct his irrigation to meet conditions. If it is known at planting time that there will be a shortage of water in June and July, crops will be planted which will not need water at that time and the limited quantity will be saved to mature fruit or other products requiring late application.

To make the prediction reliable, it is necessary to know something of the meteorological conditions prevailing before and at the time the snow was deposited. It is essential to know whether the ground was dry or saturated; whether it was warm or frozen, and many other meteorological phenomena which affect the melting of the snow.

A comprehensive snow survey then requires the use of instruments for recording precipitation, temperature, humidity and wind, as well as the water content of the snow. In the latter connection, it should be remarked that the mere measuring of snow gives no information of value. A foot of snow at one time may produce nearly a foot of water and at other times (and conditions) ten feet of snow are required for one foot of water.

The apparatus used in the determination and studies are several, and most of them must be self-recording.

A meteorograph set up and running requires attention only once a week (or longer, according to its construction), when the record-sheet must be changed. It contains a rain gage, thermometer, hygrometer and anemometer, each of which makes a continuous record upon one sheet of the precipitation, temperature, humidity, and the force and direction of the wind. The whole apparatus is inclosed in a shelter-house about four feet square.

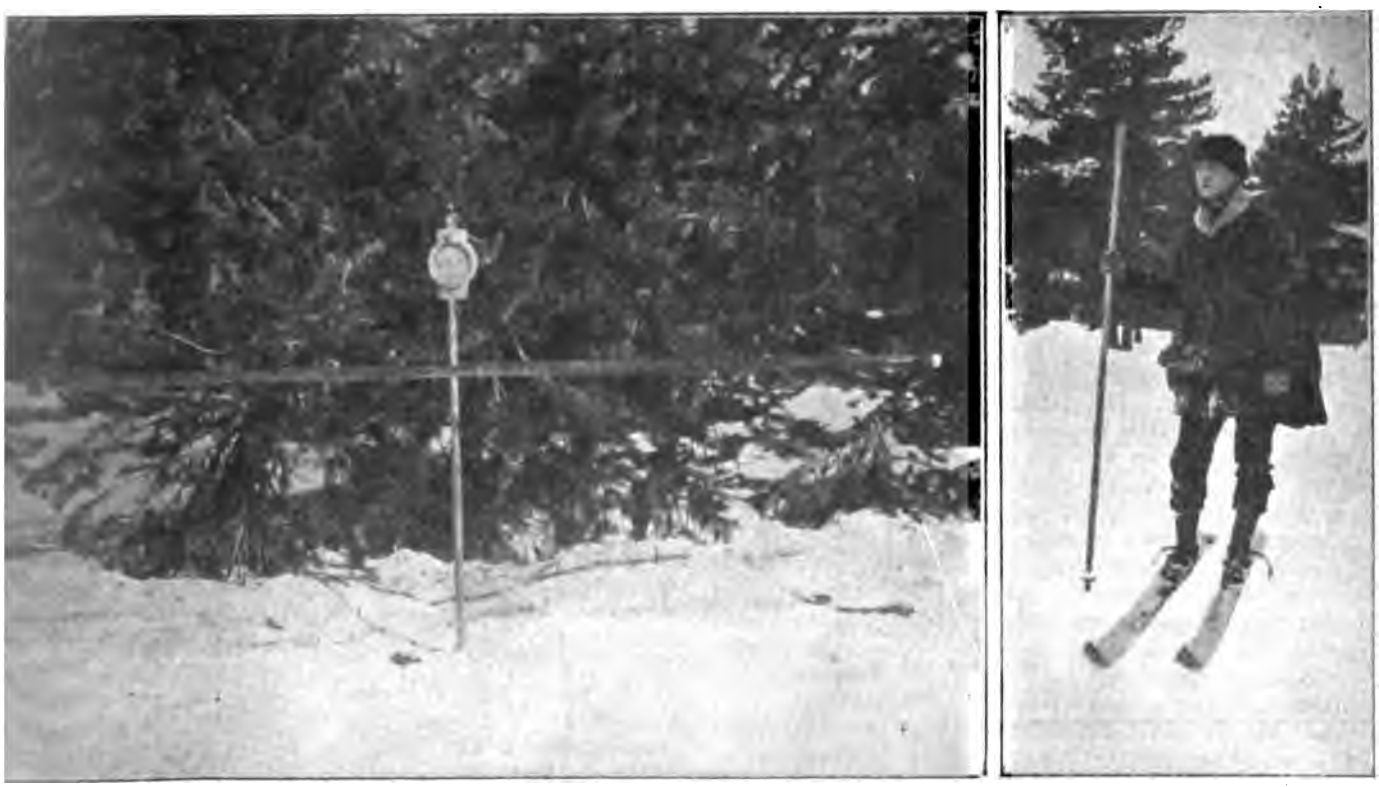
A snow-sampler consists of a light jointed metal tube, with a cutter at one end for penetrating ice or compact snow, a scale with supporting staff to weigh the sample of snow.

To conduct a snow survey, a meteorograph, or better more than one, if available, is set up in the field before the snows begin to fall. Regular visits are made to inspect and adjust the apparatus and change the record-sheet. After the last snowfall, and before spring thawing has set in, the snow is measured. Courses are laid out in selected portions of the field where average conditions prevail. With the tube a sample of snow from surface to bottom is taken and the amount of water it contains is found by weighing. The scale is graduated to read direct the inches in depth of water the column of snow will produce.

By taking a great many samples on a course and having many courses laid out, distributed well over the field, a close estimate is made of the quantity of water held in storage in that field. With the result of the samplings and the knowledge gained from the meteorograph records, a fairly accurate prognosis of the progress of melting snow and resulting water flow may be made.

It is only recently that meteorologists have taken up the study of snow in its relations to the precipitation of water it represents. They have been content with reporting the depth of snow from time to time and assuming that it represents a certain amount of water.

Professor J. E. Church, Jr., of the University of Nevada, has probably given more scientific study to the subject than any other man in the United States, if not in the world. From a pure regard of the scientific aspect,



SNOW SURVEYING INSTRUMENT AND SNOW SURVEYOR.

and a love of nature which finds delight in communing with her in all her moods, Professor Church has prosecuted his investigations for some years, mostly alone, but more recently in co-operation with the local representatives of the U. S. Reclamation Service and the U. S. Weather Bureau.

Although convinced that the study of snowfall in its relation to stream flow is of great importance and that it is one of its proper functions, the Department of Engineering has heretofore had neither apparatus nor funds with which to make the investigations.

The legislature two years ago authorized the department to engage in this line of research, but the act did not become effective in time to do anything last winter. Upon taking up the subject, it was found that some of the instruments required are not made by any manufacturer and can only be obtained by having them made to order. Under war conditions, it was found impossible to have this done.

Fortunately, however, through the good offices of Professor Church, the department has secured enough apparatus (and practically all there is in the United States) to enable investigations to be made upon the headwaters of about seven of the principal streams of the Sierras, four of which run into the Sacramento and San Joaquin valleys, and three into the irrigated districts of Nevada.

Tentative agreements have been made for the co-operation of the United States Forest Service, U. S. Weather Bureau and Reclamation officials, as well as of some large users of water in the territory named.

Professor Church has generously placed his knowledge and experience at the service of the department, and it is felt that it is engaging upon a line of research that will result in very great good.

WRAPPING GARBAGE.

During the past few years Municipal Journal has referred on several occasions to the practice adopted by different cities of requiring the householders to drain the garbage produced in their homes and wrap the same in paper before depositing it in the garbage pail. With a view to learning whether this continued to be satisfactory, we wrote to two of the larger cities, Minneapolis and Trenton, asking whether the practice had still continued.

From F. W. Cappelen, city engineer of Minneapolis, we learn that that city continues the practice of wrapping, although the garbage is no longer burned in the incinerator but is now being fed to pigs under contract. The contractor would prefer to have the wrapping omitted, but the citizens have become so convinced of the desirability of wrapping that there would now, apparently, be more difficulty in persuading them to discontinue the practice than there was originally in securing the adoption of it. The garbage there is being collected as before and placed in tanks on flat cars at a central loading station, from which it is hauled by the contractor to the pig farm about six miles from the city, the contractor paying the city $1.26 per ton for the garbage.

Trenton also continues to collect garbage under an ordinance that requires the citizens to wrap it in paper and the officials regard the plan as very successful and report that the people are very well pleased with it. One of the arguments for adopting this was the belief that it would increase the effective capacity of the garbage incinerator, and this has been found to be the case. It is found that the wrapping of the garbage effects a saving of about 20 per cent in the amount of coal used in the incinerator for destroying the garbage, this being due chiefly to the absence of water from the pails, for the water must be drained out before the garbage can be wrapped. At present there are eight wagons drawn by horses collecting garbage three times a week. The amount of collection is about 35 tons a day, but during the summer months it runs about seventy to eighty-five tons. The superintendent of collection, John McClain, states that there are, he believes, twelve other cities in the country that require wrapping of garbage.

COST KEEPING FOR HIGHWAY CONTRACTORS.*

Suggestions for Making Daily Estimates of Unit Costs—Lost Time—Daily Overhead—Installing and Shifting Plant.

By HALBERT P. GILLETTE.

Last September the Office of Public Roads, Washington, D. C., published a 52-page pamphlet entitled "Highway Cost Keeping," by Tobin and Losh, U. S. Engineer Economists. This pamphlet can be had for 10 cents, and as it should be secured by every highway contractor and engineer, it will be unnecessary to repeat in this paper anything given in that pamphlet.

Although several books and a great number of articles on cost keeping have been published during the last ten or twelve years, there still exist many contractors who apparently agree with the old time contractors who said: "The only cost keeping that I need is what my banker does for me. If his records show that I have a larger bank balance after the final payment on a contract than when I started it, then I am satisfied with my men, my methods and my luck. But if my bank balance is smaller at the end of the job, to h—— with my luck, my methods and my men."

This is the attitude of many practical men, but to all such a word of advice may prove helpful. While luck cannot be changed by having a suitable system of cost keeping, it often happens that such a system leads to a change of it. Indeed the leading object in keeping unit costs is to find out the least costly way of doing a given kind of work and the most efficient bosses. Since this is the main object, it follows that an effective cost keeping system must show the unit costs at the end of every week, and if practicable, at the end of every day. But to accomplish this purpose it is usually necessary to cut out all hair-splitting, such as most accountants and bookkeepers indulge in. Rough and ready methods of estimating the number of units of work must frequently be adopted; approximate estimates of overhead costs must nearly always be used; and, in short, the aim must be to get at the unit costs within a few per cent—say 5 per cent—rather than "to the last red cent." It is that "last red cent" ideal of the bookkeeper that is accountable for the practical failure of many a cost keeping system.

As an illustration, take almost any dirt digging job and try to apply the usual bookkeeping methods to it. The timekeeper may report each day the day's labor cost of excavating, but he does not ordinarily ascertain the yardage of earth moved that day. Perhaps the engineer can give a rough estimate of the yardage, but his estimate may be 25 per cent off, for he usually makes his guess merely by looking at the map profile or at the cut and fill marks on the slope stakes and then looking at the partly graded roadbed. Since the engineer seldom makes a careful quantity estimate oftener than once a month—and it is not always careful then—it

*Paper before American Road Builders' Association.

follows that there are very few grading contracts on which the cost per cubic yard of earth excavated is known within 10 or 15 per cent at the end of each week. As for knowing the earth yardage cost for each day, how many members of this association have ever seen a contractor who did know it?

ESTIMATING EXCAVATION YARDAGE DAILY.

For a long time the author regarded it as impracticable to estimate earth yardage costs with reasonable accuracy oftener than at the end of each week. Several years ago the author's brother, W. A. Gillette, devised a method of estimating earth yardage on grading jobs every day. The method consists in mounting a timekeeper on a horse and having him ride from gang to gang all day long, stopping 20 to 30 minutes at each gang. If a gang is excavating with fresno scrapers, for example, the timekeeper counts the number of fresno loads taken out by the gang in, say, 20 minutes, and he records the count for that gang. Then he rides on to the next gang which, let us say, is loading earth by hand into wagons. This gang is timed, for, say, 30 minutes, and the wagon loads are counted.

In the course of the day each gang is thus visited and its output counted several times. If, for example. gang No. 1 has been visited 3 times and during a total time of one hour it has turned out 50 fresno loads, it is then estimated that it would turn out 400 loads in 8 hours. An estimate is made of the average size of a load, and the total yardage output of gang No. 1 for that day is estimated. Similarly with the other grading gangs. At the end of the month the totals thus estimated are compared with a careful monthly estimate based on cross-sections. After a little experience it is possible thus to estimate within 5 per cent of the actual yardage moved.

Of course this intermittent count method can not be expected to give satisfactory results unless good judgment is used in its application. But it has been shown to the author's satisfaction that the method is sufficiently reliable when properly supervised. That it is simple is self evident.

The two greatest obstacles to the successful use of any cost keeping system are, first, a fairly accurate measurement of the number of payment units of work done each day, and second, a correct ascertainment of the total time lost or wasted by each gang. By "payment units" is meant the units of work for which price is paid, as, the cubic yard of earth excavation, the square yard of pavement, etc.

All costs should be finally reduced to so and so many cents or dollars per payment unit, so that the contractor can compare them with his contract prices. Fortunately the highway contractor has a relatively simple task in devising methods of measuring most of the payment units every day. Excavation measurements are the most difficult to secure daily, but a suggestion as to how this may be done has just been given. The yardage of pavement laid daily is readily ascertained. Since excavation and paving usually constitute the bulk of the cost of a road, it is evident that if a contractor can keep these two items of cost within his bid prices, he can usually "win out" on the entire job.

RECORDING LOST TIME DAILY.

Lost time is the bottomless pit into which more money has been dumped by road contractors than can be estimated. The author has seen, and has himself experienced, the bitterest disappointment resulting from time lost while wages were going on. It is not an uncommon thing to lay twice as much yardage of concrete on a day entirely free from delays as is laid on the average day. In other words, it seems practicable to do twice as much work daily as actually is averaged. How is this ideal to be attained, or at least approximated? Only by system, and system involves keeping costs in such a manner as to locate definitely and immediately each period of lost time for each gang, and the reason why.

Does the crusher shut down for an hour for repairs? Then the time report for the quarry must show the time of stopping and the time of starting, and the reason for the shut-down. It should be the timekeeper's duty at the end of each week and of each month to summarize all the time losses in the quarry, so that the contractor or his superintendent can see at a glance the size of this loss. Perhaps no better way than this can be invented to demonstrate what extra parts should be kept on hand to minimize delays. Here it may be suggested that whenever a new machine is purchased, the manufacturer should be asked to recommend what and how many spare parts should be carried in stock by the purchaser.

Where the cost of lost time due to break-down is kept, it frequently becomes evident that it is economical not merely to have spare parts on hand, but to have entire spare machines. Take a pump, for example, that is delivering water to concrete mixer and for sprinkling, etc. Upon the service of that one pump will depend the progress of the pavement. Yet to save an investment of $500 to $1,000 in a spare pump, many a road contractor loses several fold that sum each year. Such losses result from failure to keep records that show the cost of lost time.

DAILY OVERHEAD COSTS.

Closely associated with the question of lost time is the question of overhead costs. Among "overheads" should be included superintendence, office expense, interest and depreciation on plant. Superintendence should include some compensation for the contractor's own time. To the author it seems desirable to divide the contractor's compensation into two parts, (1) salary and (2) profit. The salary should be only as large as would be paid to a skilled superintendent. The profit should cover both compensation for the contractor's skill as an organizer and financier, plus insurance against all risks for which an insurance policy can not be secured.

A common mistake in estimating "overheads" consists in dividing the annual overhead cost by the number of working days in a year, instead of dividing by the average number of days actually worked. In our northern climate the number of days actually worked by a given organization on road construction usually averages about 125, but there are 300 working days in a year; hence a highway contractor and his plant are usually idle nearly 60 per cent of the working days of the year. If a contractor's annual salary as a superintendent be added to the annual salaries of his permanent employes, and if this salary total be divided by 125, instead of by 300, the salary "overheads" per day worked will be ascertained for all practical purposes. Similarly as to plant "overheads" and office rental "overheads."

The total "overheads" per day actually worked must be apportioned among the units of work done. Both highway contractors and engineers who have not been accustomed to prorate overhead costs in this manner will get some surprises. Failure to do this is largely accountable for the fact that so many road contractors "go broke," and it also throws light upon the fact that a good many engineers think that road construc-

tion can be done more cheaply by day labor than by contract.

Having estimated the overhead costs per "day worked" (not per working day), some of these daily overheads can be assigned directly to a given class of work. Thus, the daily interest, depreciation and repairs on a concrete mixer can be assigned to the pavement. But certain of the daily overhead costs must be prorated to the different classes of work. There are several theories of prorating joint costs which the author has discussed at some length in the Handbook of Mechanical and Electrical Cost Data. Usually it suffices on construction work to prorate overhead salary costs in proportion to direct labor costs. Thus, if the direct labor cost of grading is $50 a day and the direct labor cost of paving is $100 a day, and there are no other direct labor costs, then one-third of the daily cost of general superintendence and office expense is assigned to grading, and two-thirds to paving. Having assigned all the daily overheads to the different classes of work, divide each assigned total by the number of units of work performed each day worked, to get the unit cost of overheads for each day. It should be noted that by using this method there are no overhead costs for the days on which no work is done, for all the overhead costs are assigned to the days actually worked each year on the average. While there are some objections to this method, it is the only method by which the total unit cost can be estimated with any degree of accuracy for each day worked. And it is highly important to have such an estimate in order to know whether a profit is being made or not. The average road contractor who has a unit cost-keeping system usually is deceived into thinking he is making money, because the daily overheads are either not known or are not properly allocated to the various classes of work.

COST OF INSTALLING AND SHIFTING PLANT.

There is another source of error in estimating daily or weekly or monthly profits which arises from failure to segregate the cost of installing, shifting and removing the various plant units, together with miscellaneous costs of getting ready to do work. It is rare that any contractor is able to state what these "preparatory costs" have been on any given job, and this holds true even where the contractor has a cost keeping system. No argument is needed to prove that unless the "Preparatory costs" are known, there is grave danger of underestimating the total unit costs.

Having so kept the daily records as to show the actual cost of moving and installing a crushing plant, for example, to this should be added the estimated cost of shifting it (where shifting will be necessary) and the cost of dismantling and shipping it home. Then this total should be divided by the total number of cubic yards of stone to be crushed on the given job, to get "the unit preparatory and shifting cost" of crushed stone.

This unit cost should be added each day to the "unit overhead cost" and the "unit direct cost" for that day. The resulting total will then be really significant as to what the pavement is actually costing.

IMPORTANCE OF DAILY UNIT COSTS.

It will be noted that the author is contending for the daily and weekly estimating of the total unit cost of each class of units upon which there is a contract price. Unless this is done it almost invariably happens that a road contractor who thinks he has been making a profit on a job awakens toward its close to find that he has actually lost money on it. Now, he may lose money on the job even if he does have complete unit costs before him every day, for it is very common to bid so low a price that no profit can possibly be made. But it is surprising what a difference there is in the energy of a desperate man as contrasted with one who is well satisfied. When a contractor realizes that he is daily sinking deeper into the quicksands of bankruptcy, he will usually "camp on his job" night and day, and his wits will be steadily at work; whereas if he thinks he is making a satisfactory profit, he is apt to take things easy, let well enough alone, go off on frequent pleasure excursions and the like.

Incidentally it may be remarked that one of the reasons why day labor so frequently exceeds the cost by contract lies in the psychological fact that the engineers and superintendents in charge of the work have no pecuniary stake in the cost of the work.

SUMMARY.

Summing up, a road contractor can use his brains to no better advantage than in finding ways of securing daily reports that show the total unit cost of every item on which he has bid a unit price. To do this it is frequently necessary to invent methods of securing approximately correct estimates of the number of units of work done, and it often pays to employ an engineer for no other purpose than to measure up daily the number of units. Lost time should be reported daily and its cost estimated. Overhead costs should be estimated per average day worked, not per working day, and unit overhead costs estimated every day. Plant, preparatory and shifting costs should be kept apportioned to each class of work, and reduced to unit costs.

If these methods are adopted, profits will be increased or losses decreased. If engineers in charge of contract work will follow the same method, they will usually discover that there is little or no profit to the average road contractor. Indeed, unless engineers give adequate study to the costs of lost time, overheads, plant installations, etc., and unless they devise ways of enabling competent contractors to secure adequate prices, it will be only a matter of a few years before there will be no competent contractors in the road building business.

INCLINED VIADUCT FOR PEDESTRIANS.

To avoid the necessity of a long detour, or else a dangerous track crossing and the climbing of a flight of steps up the bank on the further side, the viaduct shown in the illustration was built to be used by pedestrians only, steps at the end insuring that teams do attempt to use it. The approach is built with concrete retaining walls; the remaining portion being of steel girder and trestle construction. The pipe railing on each side has wire fencing fastened to it to prevent children from falling through.

The WEEK'S NEWS

New Highway Legislation in Indiana—County Engineers in Washington—Planning New Jersey Highway System—State to Analyze All Water Supplies in Indiana—California's Proposed Hydroelectric Development—Water-Power Development in Canada—Fire Prevention in Indianapolis—Pennsylvania's Forest Fire Loss—Proposed Federal Utilities Board—New Manager Towns—Proposed American Mayors' League.

ROADS AND PAVEMENTS

Indiana Highway Legislation Passed.

Indianapolis, Ind.—Indiana now is ready to carry out a big program of road construction under the state highway commission and county unit road laws which have been enacted by the legislature and which contain emergency clauses. If Indiana matches all the federal aid money available up to and including 1921, almost $15,000,000 will be expended on state highways in three years. How much will be expended under the county unit law and the old three-mile road law, is not estimated, although it is believed that the amount will greatly exceed that which will be expended under the direction of the state highway commission. In 1914, before the war put a check on bond issues, about $8,000,000 was expended in the state under the three-mile road law. In many cases it is believed that the county unit law will be used instead of the three-mile road law. Under the county unit road law, bonds may be issued up to 2 per cent of the assessed valuation, while under the three-mile law the bonding limit is 4 per cent. Under the new tax law, however, all bond issues must be approved by one of the state board of tax commissioners, unless an issue is for $50,000 or more, and in the event the state board of tax commissioners disapproves such an issue, its decision may be overthrown by a referendum vote of the taxing district. This power of the state board of tax commissioners may operate to place a check on extravagant or ill-considered road projects under the county unit or three-mile road laws. The state board may, if it chooses, refuse to approve a bond issue under either of these laws, even if the issue is within the 2 and the 4 per cent limit. The state board also has the power, "to finally determine all tax levies of the state," and this power will affect the road program, inasmuch as road construction leads to tax levies. There is available for state highway construction in Indiana $2,163,392.44 of federal aid money, which under the fifty-fifty federal law must be matched by the state. By June 30 of this year there will be available $539,967.76 more of federal aid money. It is not believed that the state can use all of this money this year, but the sum not used will remain to the credit of the state. The state funds available this year will amount to about $2,000,000. Up to and including 1921, there will be available for Indiana a total of $7,428,-078.10 from the federal government. The new county unit bill provides that in the building of roads costing more than $2,000 a mile, or a bridge costing more than $2,000, a petition of fifty freeholders of a district to be assessed may cause the plans and specifications to be submitted to the state highway commission for approval, and another petition of fifty freeholders may bring about inspection of the work on the road by a representative of the state highway director. The law takes the supervision of dirt roads from the township trustees.

Plan to "Take County Engineer Out of Politics."

Olympia, Wash.—A bill to abolish the office of county engineer and to substitute a superintendent of highways appointed by the county commissioners and to serve as long as he makes good, has been prepared by representative J. V. Hubbell, of Kittitas. This bill would make the county commissioners agents of the state highway department and require the appointment of a competent engineer with five years' experience as highway superintendent, the state to pay the superintendent $100 a month and the county such other salary as may be necessary, not to exceed $5,000 a year. "This would make it possible to build up in the state a real highway machinery," says the author of the bill, "and the superintendents would get the training and experience so that in time they would become expert engineers. It would be a much better plan for the state than the present one. It would take the county engineer out of politics."

Plan to Unify County Highway System.

Trenton, N. J.—Recommendation is made in a report submitted to the legislature by the state commission for the investigation of county and township highways to place control of county highways in the hands of boards of freeholders, but with final authority resting with the state highway commission. This recommendation will not lessen in any way the jurisdiction of the freeholders, and final authority with the state will only be used to guide the county highway control into channels which will make necessary co-operation between counties, the report declares. The commission advises each county to exercise its jurisdiction in county highways through the medium of a committee of not more than five members, each to be a member of the board of freeholders. It is also recommended that all bridges, culverts and structures of a similar nature which are integral parts of a county highway should be treated as such in all questions of jurisdiction, engineering and finance. Activities of the county highway committee, the commission advocates, should be performed through a county highway department. By the creation of these departments there will be set up in all the counties of the state a central organization through which the scattered operations now performed by the county highways committees, county bridge committees, county engineer and county supervisor of highways can be assembled, correlated and unified. Under this plan, there will be one head upon whom can be fixed individual responsibility for getting all the work in connection with county highways done properly. Similarity of structure and method of operation of these departments, and the fact that the intent will be to carry out policies working for a goal common to all of them, will be a step in the direction of unifying twenty-one systems and co-ordinating county highways. The head of the department should have the power to appoint, subject to the approval of the highway committee and freeholders, all assistant officers and other employes necessary. He should also have authority, the commission believes, to build up whatever type of engineering organization and conduct its operations as he may deem best. Engineering operations, it is declared, conducted in connection with the county highways of the several counties should be differentiated in accordance with the definitions of terms now or hereafter provided by law to be used in continuing these activities on the highways of the state system. Provision is made to prevent the waste of money by the counties in putting through highway operations which meet the exigencies of the moment, but are so short-lived that they must be repeated at frequent intervals.

The commission recommends that each county highway committee should submit to the freeholders and the state highway commission all activities the committee deems advis-

able for the county to undertake in the matter of county highways during the period between January 1, 1920, and December 31, 1924. It is advised that the freeholders hold a public hearing at the courthouse October 15, this year, at which the five-year work plan and written suggestions upon it submitted by the state highway commission should be considered and any taxpayer given an opportunity to express himself upon the program.

Instructions are recommended that the freeholders of each county shall not later than November 1 this year file with the state highway commission the five-year program of county highway projects. The state highway commission, not later than November 15, should have power to accept the program and order changes it believes best in the interest of the state and counties.

Under this plan the state highway commission should have the power to obtain from each board of freeholders information regarding its expenditures for county highways. In this connection, it is recommended, the commission should also have authority to require the use of such blank forms as it may deem proper for the supplying of this information, and to cause the submission of the blanks properly filled in at such time and place as it may specify. This would enable the keeping of complete and accurate records regarding the expenditures made annually by each county and by all the counties of the state upon county highways.

WATER SUPPLY

All Water Supplies Must Be Analyzed by State.

Indianapolis, Ind.—With the signing of a new bill by Governor Goodrich, arrangements were started by Harry E. Barnard, state food and drug commissioner, to receive samples of water for analysis in the water and sewage laboratories. The law requires that all companies selling water in the state, including mineral and bottled water, shall submit samples for analysis before July 1. Although the bill carried no emergency clause, it is expected that it will be promulgated with others in time to admit of a test of the drinking waters of the state this year. The state board of health, under the provisions of the bill, is authorized to quarantine the source of a water supply found deleterious to the public health. The bill provides than any party believing himself aggrieved at the board's ruling may have the right to appeal to the courts within ten days on filing a bond for the costs of such action. Severe penalties attach to violations of the regulations of the board relative to the sale of water ranging from a minimum fine of $10 to a heavier penalty to which may be added a jail sentence.

Water Rate Increased for Large Consumers.

Wilmington, N. C.—An ordinance revising the rates to be charged and collected for water furnished by the city plant for domestic use and other purposes has been adopted by the city council, effective April 1. The ordinance makes only slight change in the present rate to small consumers but carries an increase on the larger users. The measure was introduced by councilman E. A. Metts, chairman of the waterworks committee, who stated the plant is now losing money. He said the increased rate would fall on less than one hundred firms of the city. The ordinance revising the water rate carries a graduated scale, ranging from $1.50 per 1,000 cubic feet for 2,000 or less consumption to 80 cents per 1,000 where the consumption is more than 50,000 cubic feet, with a minimum charge of $3 per quarter. Fixture rates are placed at $2 per house per quarter for one fixture, with $1 for each additional fixture. Discounts of 10 per cent will be allowed for payment before the 10th of the month in which the quarter begins.

STREET LIGHTING AND POWER

Light Company Declared to Have Perpetual Franchise.

Omaha, Neb.—The United States circuit court of appeals at St. Paul, Minn., has decided that the Nebraska Power Company has a perpetual franchise for the supplying of electric heat and power in Omaha. The court affirmed the opinion of district judge Woodrough in Omaha. The question of the electric company's franchise to supply electric light in Omaha had already been decided by the United States supreme court in the Colony Trust company case. The present decision makes a complete victory for the electric company so far. Following the decision as to the light franchise the city passed a resolution that the electric company could not distribute more electric heat and power under its franchise. The company secured an injunction, and it is on this injunction that the present case was based. Corporation Counsel Lambert will appeal the case to the United States supreme court. It has already been in the circuit court six times and to the supreme court three times on various phases of the question. The decision, says Mr. Lambert, does not absolutely prevent the city from acquiring the electric plant, but the ownership of the perpetual franchise would tend to vastly add to the price the city would have to pay. He says he believes there is a good chance that the United States supreme court may reverse the circuit court decision.

California Plans Big Water-Power Projects.

Sacramento, Cal.—Development of hydro-electric power and the irrigation of 25,000 acres of land in Superior California through the construction of storage reservoirs on the rivers and streams tributary to the Sacramento River is about to be undertaken by the state of California. It is proposed to construct at least seven storage reservoirs of large capacity on the Yuba, Feather, American and Bear Rivers and on the other streams flowing into the Sacramento. The territory to be affected is located between Redding and Sacramento. At the present time there are no irrigation systems in this territory outside of those immediately adjacent to the Sacramento River. A vast acreage of land capable of irrigation lies in the foothills and rolling land away from the big stream, and this it is proposed to serve by the state irrigation project. The development of cheap hydro-electric power is also expected to be an immense stimulus to industry in the region indicated. Present plans have to do not only with the exploration of the territory with a view to selecting the sites for the storage reservoirs. At the present time experts connected with the state engineering deparment have in view seven available sites, capable of impounding vast bodies of water which is now running away, a flood menace to the low lands and a waste besides. It is expected that the exploration program will develop a number of other good sites for reservoirs. W. F. McClure, state engineer, has placed the exploration work under the supervision of S. W. Curtis, assistant state engineer. It is expected that the work will require about a year. At the conclusion of the exploration for available storage sites, a report will be made to the state engineering board, after which the surveys will be made with a view of estimating on the cost of construction, which will run into the millions of dollars.

Water Power Resources of Canada Being Developed.

Ottawa, Canada.—A census of the developed waterpower in the Dominion just completed by the Dominion Water Power Branch, in co-operation with the Dominion Census Bureau, discloses some interesting figures. The water-power resources of Canada, with their strategic locations adjacent to practically every industrial centre, the report says, constitute one of Canada's greatest assets, and it is satisfactory to note that the economic advantages accruing from utilization of these powers for industrial purposes is being fully realized in practice. The returns indicate a total developed water-power capacity of 2,305,-310 horse-power. This figure is several hundred thousand in excess of any estimate previously published, and indicates that Canada's utilization of hydro power is even more marked than had been realized. Of the total water-power developed, 1,727,471 horse-power is installed in central electrical stations, that is to say, in stations developing electrical energy for distribution and sale; 352,-214 horse-power is installed in plants owned and operated by pulp and paper companies, and 225,625 horse-power is installed in other miscellaneous manufacturing and general industrial establishments. The foregoing figure for pulp and paper companies does not, however, represent the total amount of water-power used in that in-

dustry; upwards of 100,000 horse-power of hydro-electric power in addition is purchased by pulp and paper companies from central electrical stations, making the total hydro-power utilized in pulp and paper industry some 450,000 horse-power. The central stations already constructed throughout the Dominion are designed for a machine installation of 530,000 horse-power, in addition to the machinery now installed. Of this amount, the installation of some 270,000 horse-power is at the present time under contemplation in various parts of the Dominion. These figures do not include the 300,000 horse-power Queens town plant, which the Hydraulic Power Commission of Ontario has under construction at Niagara. The per capita figures of hydro-power developed for the Dominion, when compared with similar figures for other countries, are indicative of the advanced position which this country takes, both in the extent and in the utilization of its water-power resources. Norway, and possibly Sweden, are said to be the only countries where the per capita utilization of water-power exceeds that of Canada. The most recent figures available for the United States would indicate a utilization of less than 100 hydraulic horse-power per thousand population, as compared with 276 per thousand in Canada. The fundamental reason, it is said, which underlies the extensive use of water-power in Canada is the fact that practically every commercial centre from coast to coast, excepting only a few in the middle prairie provinces, has abundance of water-power available, not only for present needs, but for all anticipated requirements.

FIRE AND POLICE

To Start Two-Platoon System.

Boise, Ida.—Council has passed an ordinance providing for a two-platoon system in the city fire department. It provides that, "At the expiration of six months' operation of the two-platoon system in the fire department, the chief be instructed to make a complete report of the working of the new system, to show comparisons with the present plans, and that the council shall then determine whether to revert to the old plan or not." The new system will go into effect April 1.

Fire Prevention in Indianapolis.

Indianapolis, Ind.—A. L. Taggart, president of the board of public safety, has made the following announcement relative to the newly organized city fire prevention bureau: "With the establishment of the municipal fire prevention bureau, the city of Indianapolis has a right to expect results and the board of safety is responsible. Under the system which the board is now putting in operation, chief John C. Loucks and Jacob H. Hilkene, director of the fire prevention bureau, will be jointly responsible for the fire prevention work done by the department. The battalion chief in charge of each district will be held responsible for the work within his district and will be required to see to it that captains, lieutenants and members of their commands conduct inspections diligently and faithfully report such inspection. The opportunity for real service to the taxpayers of this city lies within the grasp of the fire department. This can be done by systematic, intelligent inspections conducted in a courteous manner, showing not only to the owners of large business buildings but also to owners or renters of the smallest cottages, how the hazard from fire may be reduced to a minimum." It is the object of the board to have the firemen in each district familiar with every building in that district to the end that fire hazards will be reduced and that in case of fire the firemen wll not work at a disadvantage.

Big Fire Loss in Pennsylvania.

Harrisburg, Pa.—The assertion recently made by Gifford Pinchot, chairman of the committee on conservation of the Pennsylvania State Grange, that Pennsylvania's fire losses amount to $50,000,000 annually is based on information obtained from the State Forestry Department. According to George H. Wirt, chief forest warden, and head of the Bureau of Forest Protection, the actual loss in timber is $500,000 a year. This, he says, is only a small part of the loss, for it does not include the loss in buildings, fences, timber in various stages of manufacture, and to the humus and litter that act as mulch and prevent rapid evaporation. It does not include the loss of seeds, seedlings and sprouts, birds, game and fish. The biggest item not included in the $500,000 loss is the millions of dollars' worth of lumber that could be grown on the hundreds of thousands of acres of land which are burned over annually and allowed to remain barren. These wastes, devoid of moisture-holding soil, permit the rains to go immediately into the streams, and the floods that destroy much property result. The $50,000,000 estimate is conservative, according to Mr. Wirt. "The prevention of forest fires is absolutely necessary for the welfare of the state," he said, in discussing the Pinchot statement. "Some fires will always occur, but they must be extinguished quickly, and this means that Pennsylvania must have an efficient organization and equipment for prevention, detection and extinction. In this state I believe that the best organization is through the foresters and rangers and special police who operate from tall towers. The game protectors also are forest wardens. The force of wardens, however, must be limited in this state now because of our lack of funds. The department should be supplied by the Legislature with from $150,000 to $200,000 a year for ten years. This fund would provide adequate money for permanent towers and the building up of a force. Then the appropriations could be decreased. There are now eleven steel towers, some not on state forest lands, and thirty-two wooden towers. From some of these the wardens can see twenty-five to thirty miles on clear days. If this system were provided, we could cut the forest fire losses from $50,000,000 a year from all causes to $1,000,000. Pennsylvania has much the same system as Massachusetts, except that there the appropriation is larger and the system can be carried out in detail. The size of the average tract burned over in that state last year was but eleven acres. In Pennsylvania the average number of acres burned in each forest fire was 154, while last spring it was 163. The tower plan of watching is satisfactory and when fires are discovered telephones can be used to round up men from all directions, and these can be hastened to the fire in automobiles. The wireless telephone will soon be practicable for the fire wardens, and this will reduce the losses by reason of the fact that fire fighters from all directions can be summoned at once."

GOVERNMENT AND FINANCE

Federal Utilities Board Proposed.

Washington, D. C.—Several Government departments have under consideration the organization of a board to hear cases involving disputes over rates between local authorities and street car, gas and electric companies, and other public utilities, and to make recommendations. No legal power would be sought to provide for the carrying out of these recommendations, dependence being placed upon moral influence. The proposal was discussed with President Wilson before his departure for Europe and his approval was asked. Some anouncement of the Government's course is expected soon. The need for some sort of Federal action to stimulate the consideration by local authorities of utilities' applications for higher rates grows out of the fact that wages and costs of materials are rising, and in many cases higher wages have been granted at the order of the War Labor Board. City councils, utilities commissions, and other local authorities have been slow to act on applications for higher rates to meet increased operating costs, according to reports to the War Finance Corporation, War Labor Board and Labor Department. Consequently it is reported that many utilities face a serious financial situation. Since these utilities, particularly street car companies, are large employers of labor, and purchasers of supplies, the Government is concerned. Conferences between officials of the Treasury, Labor Department, and the War Labor Board resulted in the suggestion to President Wilson that he ap-

prove the formation of a voluntary board, composed of representatives of utilities, employes, and Government departments, to hear appeals of utilities rates either from the company or public interests. The Board's decision would not be absolutely binding, but officials point out that its authority might be somewhat comparable to that of the War Labor Board as now constituted. Arguments against the plan presented by Government officials are that it might savor of extended Government interference with local business affairs, and the Government is represented as anxious to promote the "hands-off" policy as rapidly as readjustment conditions justify. This situation has postponed adoption of the plan heretofore. About one hundred public utility corporations have applied to the War Finance Corporation for loans to tide them over the period of financial stress caused by soaring operating costs not matched by rate advances. In most cases the company's financial conditions were regarded as not healthy, however, since adequate security could not be furnished, and assistance was not given. Only nine public utilities have obtained loans, aggregating $39,000,000, from the corporation.

Two New Manager Towns.

Muskegon, Mich.—By a 4 to 1 vote, the city has adopted a new charter providing for the appointment of a manager. The population is about 26,000.

McCracken, Kans.—This town has adopted the commission-manager form of government by a vote of 87 to 4. The population is about 1,000.

Town Wants City Manager.

Hays, Kans.—This town wants a city manager to begin work at once. The salary will be about $3,000 a year. Applications should be addressed to Secretary, Chamber of Commerce, Hays, Kansas. The city manager must be an engineer. The engineering and building assets of the community that the manager must superintend in addition to other duties include the light plant, waterworks, city hall and sewer system. The city manager form was approved at a recent election by a two-to-one vote. Hays is a town of approximately 3,300 people located in western Kansas, on the Union Pacific.

Wealthy Suburb Refuses to Join Boston.

Brookline, Mass.—The citizens of this town, which is a wealthy suburb of Boston, at a town meeting, have voted 193 to 1 against annexation to Boston. Mayor Peters, of Boston, recently started a campaign for a greater city by annexation of surrounding towns. Brookline has lower tax rates than Boston and is satisfied that the town form of government has resulted in adequate administration. At the town meeting, the appropriations committee recommended annual appropriations totalling $2,538,288.

Mayors Want American Mayors' League.

Washington, D. C.—Following the recent Governors' and mayors' conference held here, a number of the mayors present met and unanimously voted to recommend to all mayors of cities of 25,000 population or over the formation of a permanent organization which may perhaps become known as the American Mayors' League. A resolution was passed requesting the Secretary of Labor to call such a conference not later than Feb. 1, 1920. All agreed that there should not be over one set speech each day of a conference extending to at least four days. It was also voted that Congress be asked to adjourn at least one day during the conference, and hear the report which the mayors might have to offer. The following committee was appointed to take all matters concerned into consideration and report: Chairman George L. Baker, mayor of Portland, Ore.; secretary, R. W. Babson, Boston; together with F. W. Donnelly, Trenton, N. J; W. Montague Ferry, Salt Lake City, Daniel W. Hoan, Milwaukee, Wis; and R. J. Wheeler, Allentown, Penn.

LEGAL NEWS

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Garbage Removal Contract—Compliance—Payment.

(Mo.App.) Where garbage removal contract required performance to satisfy the city council, the council could not arbitrarily refuse payment for completed services because they were unsatisfactory; but such clause merely permitted termination of the contract when the services became unsatisfactory, so that the contractor could recover the price on a showing of substantial compliance with the contract.—Boyer v. Kansas City, 205 S. W. 873.

Invalid Issue of Bonds—Bonded Indebtedness.

(Ill.) Where a municipal corporation has made an invalid issue of bonds, a subsequent issue to replace such bonds, enjoined by the courts and thereafter destroyed, will not be included in estimating the bonded indebtedness of the municipality.—Worley v. Idleman, 120 N. E. 472.

Sale of Asphalt by City—Price Subject of Ordinance.

(Wash.) A taxpayer may maintain an action to enjoin a city and its street superintendent from selling asphalt manufactured by the city until an ordinance has been passed fixing the price at which the product may be sold; such ordinance being required by the charter.—Shanstrom v. Case, 175 P. 323.

Police Power of City to Regulate Construction of School Buildings.

(Utah.) Police power conferred on cities should be construed and applied so as to meet the dangers incident to and arising out of the subject-matter covered.—Salt Lake City v. Board of Education of Salt Lake City, 175 P. 654.

(Utah.) Comp. Laws 1907, section 206, subds. 55, 56, do not give to cities the power to regulate the construction of public school buildings, in view of sections 1892-1961, placing control of public schools of cities of first and second class in boards of education of such cities, section 1962, as to compulsory attendance, and Const. art. 10, as to control of public school system being vested in Legislature.—Id.

The mere fact that no police powers are vested in boards of education is not decisive of the question whether the state has by Comp. Laws 1907, section 206, surrendered to cities police power over public school buildings.—Id.

School buildings are not included within designation "public buildings" or "all buildings" mentioned in Comp. Laws 1907, section 206, subds. 55, 56, as to power of city commission to require buildings to be constructed of fireproof material, etc.—Id.

Ordinance of Salt Lake City, section 435, requiring the placing of fire alarms or telephones in all school buildings, is valid.—Id.

Rights of Pedestrian and Automobile on Street.

(Mass.) Neither pedestrian nor driver of automobile has rights in street superior to those of other, but each is bound to act with reasonable regard to other's presence.—Emery v. Miller, 120 N. E. 655.

Raising Grade of Street Above Ditch—City Liable for Flood Damages.

(Cal.) Where contractor, in raising grade of street above a ditch, a change which flooded abutting property, acted under instructions of city engineer, rather than terms of city ordinance or his contract, the city, having accepted street and maintained it, was liable for his act and the flooding.—Newman v. City of Alhambra, 175 P. 414.

NEWS OF THE SOCIETIES

April 14-18.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Mineral Wells, Tex. Secretary, F. A. Rountree, Birmingham, Ala.

April 16-17.—AMERICAN WATER WORKS ASSOCIATION, IOWA SECTION. Fourth annual meeting, State University, Iowa City, Ia. Acting Secretary, J. H. Dunlap, State University.

April 25-26.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, Logan Hall, West Philadelphia, Pa.

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

Associated General Contractors of America.

At a meeting of the Executive committee of the Associated General Contractors of America, held in Washington recently, it was decided to engage G. W. Buchholz as acting secretary of the association with the duties of executive manager. Wm. A. Davis was also employed with the title of organization manager to assist the secretary.

Mr. Buchholz graduated from Columbia University, a civil engineer, in 1901. Since that time he has engaged in general contracting principally with the Snare & Triest Co., New York, and the North-Eastern Construction Co. of New York.

Mr. Davis was recently connected with the War Labor Board and has successfully organized a number of industrial associations, prominent among which is the National Association of Manufacturers.

The association has taken offices in the Conway Building, 111 West Washington Street, Chicago, which will be its headquarters, with a branch office in New York, which will be at 225 Fifth Avenue, until May 1.

Oklahoma Society of Engineers.

The annual meeting of the Oklahoma Society of Engineers, which was postponed last October because of the influenza epidemic, was held in Oklahoma City, Mar. 6. Reinforced-concrete tanks were discussed.

Officers of the society for the short term of 1919 were elected as follows: President, T. P. Clonts, county engineer, Muskogee; vice-presidents, Col. Frank B. King, R. E. Brownell and D. W. Patton; secretary, H. V. Hinckley, Omaha City, Okla.

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Desplaines, Ill., is contemplating PAVING IMPROVEMENTS, involving three miles of asphalt or concrete. The consulting engineers are Ewing & Allen.

PAVING IMPROVEMENTS are to be made by the city of Bristow, Okla., for which preliminary plans have been prepared by the Benham Engineering Co., consulting engineers.

PAVING IMPROVEMENTS, including paving and curbing, to cost $50,000, are to be made by the village of North Canton, according to plans prepared by the consulting engineering firm, Guily & Rice.

Leon county, Centerville, Tex., is to make ROAD IMPROVEMENTS, consisting of the construction of the east branch of the Exall highway, involving an expenditure of $146,000. The consulting engineers are Bryant & Huffman.

The city of Edgerton, Wis., will take bids on approximately 30,000 square yards of reinforced concrete PAVEMENT and two miles of sanitary SEWERS. Plans have been prepared by W. F. Reichardt, constulting engineer.

Cuyahoga Falls, O., is taking bids on bonds for WATERWORKS IMPROVEMENTS to cost $300,000. W. J. Sherman is the consulting engineer.

A PUBLIC PARK is to be built by the city of Boston, Mass. It is to include concrete walks, retaining walls, drinking fountains, etc., and the plans were prepared by the consulting engineer, Charles E. Putnam.

SEWERAGE WORK, involving storm and sanitary sewers, is contemplated by the village of Bexley, O., according to plans prepared by the consulting engineering firm of Jennings & Lawrence.

ROAD IMPROVEMENTS are to be made in Van Buren, Stone and Newton counties, Little Rock, Ark., involving the construction of 64 miles of road. The consulting engineers are Pritchett & Hight.

Kansas City, Mo., is receiving bids for the construction of a concrete VIADUCT for street car and highway with approaches about 3,000 feet in length. The estimated cost of this structure is $700,000, and plans were prepared by the consulting engineers, Harrington, Howard & Ash.

PERSONALS

Blanchard, Arthur H., consulting highway engineer, has been appointed Chief of the Bureau of Public Works, Department of Citizenship, under the Army Overseas Educational Commission. General Pershing has requested the Y. M. C. A., through its Commission, to take charge of the development of instruction and courses for all educational work of the Army overseas. The staff of the Bureau of Public Works and Army instructors in 500 post-schools throughout France will give lectures and courses relative to waterways, railways, highways, bridges, water supply, sewerage, waste disposal, public utilities and irrigation. Special emphasis will be placed on the economic value of good roads to the nation, state, county and town, and on efficient methods of highway, railway and waterway transportation.

Sands, E. E., has resigned as chief engineer of the city of Houston, Tex., to go to New York where he will engage in private practice. He had been in Houston since 1912. As consulting engineer and assistant to the construction quartermaster, Mr. Sands directed the laying out of Camp Logan. As a government man at government pay, on leave of absence from city work, he built the sewer and water systems at Kelly Field at San Antonio. Gerstner Field at Lake Charles, La., and many other government assignments were under his direction.

Routh, James W., engineer for the Rochester, N. Y., Bureau of Municipal Research, has been appointed director to succeed Le Roy E. Snyder. The newly chosen director of the research bureau has been associated with the institution since its establishment four years ago, being the principal worker in the preliminary survey of the local city government, prior to the establishment of the bureau. He was also associated with the New York Bureau of Municipal Research. Mr. Routh is a practicing civil engineer, holding degrees from the University of Minnesota, also Cornell University. While active in his profession he was in charge of the construction of a large hydro-electric plant near Spokane, Wash.

Booth, R. A., has resigned as state highway commissioner of Oregon.

Davis, Charles, was recently reelected mayor of El Paso, Tex.

McVea, J. C., has been appointed acting city engineer of Houston, Tex., to succeed E. E. Sands, resigned.

Shannon, Lieut. G. D., Ordnance Department, U. S. A., formerly highway division engineer, Vermilion County, Illinois, has received his discharge from the service and has become highway engineer of the Joplin, Mo., road district, in charge of construction.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

PORTABLE POWER LOADER.

For Handling Gravel, Sand, Stone, Etc.

Those engaged in construction work are proving to themselves more and more that economy lies in the reduction or elimination of hand labor. The price of labor is high, and time is always a factor in work because of high overhead costs. In a large proportion of construction work the handling of materials, particularly in loading and unloading, is responsible for substantial costs. These can be cut materially by substituting mechanical loaders for the slow and inefficient hand shoveling.

The Conant loading machine is made of steel, the frame being built of angle bars, braced and reinforced, with intersections hot riveted. Wheels and running gear are entirely of metal. It is designed and built for heavy duty in handling materials of various sizes, including those which are abrasive. The height of the standard loader is 11½ feet and the length is 8½ feet. The height of delivery is 7 feet 8 inches to 6 feet 10 inches.

The loader is of the bucket-and-chain type. The chains consist of two strands of Griplock chain, tested for 4,600 pounds working strain, or heavy detachable link chain, the joints being protected. For sand and gravel handling the buckets, which are of malleable iron, and of which there are about twenty, are 16 x 8 inch or 14 x 7. They may be equipped with digger teeth if desired. Power for operation is from a 5-h.p. electric motor or an Ideal gasoline engine, the latter being, of course, generally required for gravel bank work.

With a Conant loader it is estimated that two men can do the work of six or eight hand shovelers in handling gravel, sand or crushed stone. The standard machine handles more than a cubic yard of aggregate material, and can fill a large truck in four or five minutes. At Camp Devens, Ayer, Mass., a contractor saved more than $100 a day in the handling of materials, cutting down his labor from more than twenty-five to six men.

The machine is also used for handling coal at power plants and other utilities. It can load direct from bottom dumping cars onto truck or wagon. It may be equipped with screening apparatus. There is a specially heavy type for gravel bank work.

The loader is made by the Conant Machine Company.

POWER LOADING MACHINE.

INDUSTRIAL NEWS

Federal Board Lowers Steel Prices.

The first result of the formation of the Industrial Board of the Department of Commerce is the reduction in steel prices following conferences with the representatives of the steel industry. The prices are lowered by $5 to $7 per ton. George N. Peck, Moline, Ill., is Chairman of the board. The procedure of the board is to suggest prices which will be accepted by the U. S. Government as equitable and which will be made the basis of all government purchases. It is hoped in this way to bring down prices generally and to encourage normal buying. Corresponding price reductions on cast-iron pipe are expected to follow reductions on pig iron throughout the country.

The Otterson Auto-Eductor Co., 817 Fairbanks Bldg., Springfield, O., has recently shipped a number of auto-eductors. One for the Utilities Department, Q. M. C., at Camp Lee, Va., is a heavy duty machine mounted on a Class "B" military chassis for use in cleaning large grit chambers and septic tanks and other purposes. Similar machines have been delivered to the Utilities Department Q. M. C., at Camp Gordon, Ga., and to the Hawaiian Department, Fort Mason, San Francisco for shipment to U. S. Army Camp near Honolulu, H. I. The company has also delivered and demonstrated a standard auto-eductor for the borough of Brooklyn, New York City. This machine was driven overland from Springfield to New York.

The Sullivan Machinery Co., Chicago, Ill., announces the appointment of Mr Chester Mott as manager of its branch office at Denver, Colorado, 837 Equitable Building, succeeding Mr. Wallace T. Roberts, recently resigned. Mr. Mott has been associated with this company for several years past in the capacity of sales engineer at its Spokane, Washington, office and more recently at its Chicago office in charge of the company's interests in Iowa, Northern Illinois and Minnesota.

The Dayton-Dick Co., Quincy, Ill., has changed its name to the **Dayton-Dowd Co.** The change was made owing to changes in organization. Capital has been doubled and the business placed directly under the control of those immediately interested. Facilities are greatly extended. The company has recently received many orders for large irrigation and drainage pumps, and it can now build any size from 1½ inch to 30 inches in a split casing type of pump. It has developed a complete line of fire pumps, complying with specifications of the various underwriters' boards. It has also developed high pressure and hydraulic pumps for boiler feed, elevator pumps and similar high pressure service, and these lines are to be pushed to the utmost.

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI NEW YORK, APRIL 5, 1919 No. 14

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Editorial Notes 245
Saving Shade Trees—Free Public Utilities—Municipal Aid for Private Plumbing.

Los Angeles Sewerage (Illustrated) 246
Operation of sewage treatment plants, purchasing sewer pipes, measuring sewage flow, and sewer maintenance. Testing a new flush tank. By the engineer of sewers of that city, **W. T. Knowlton.**

Santa Rosa's Sewerage and Water Supply 248
Water furnished free to all residences. Sewage disposal and hog raising.

Air-lift Artesian Well (Illustrated) 249
Increasing volume of flow at Clinton, Iowa. By **John Oliphant.**

Community Heating of Dwellings 249
Advocates distributing steam for heating from central stations.

Temperature Effects on Concrete Reservoir 253

Buried Streets of San Francisco (Illustrated) 253

Set-back Lines in Newton 253

To Supervise Federal Aid Work 253

The Week's News 254

Legal News—Notes of Recent Decisions 256

News of the Societies 257

Personals 258

Industrial News 258

Contract News 19

SAVING SHADE TREES.

In a list of the various classes of work done by the Street Maintenance Department of Los Angeles is one named "Making necessary investigations to save shade trees, where possible, along the line of improvements." Compare this with an Iowa city, which, because its ordinances required sidewalk paving to be six feet wide with its inner edge two feet from the lot line, refused to spare a line of full-grown shade trees by changing somewhat the location of the sidewalk paving, although there was a space 25 feet wide between curb and lot line, in which to place it. Such vandalism is criminal. Offsetting or curving a sidewalk offers no objections to be considered for a minute when the alternative is the removal of shade trees of many years' growth.

FREE PUBLIC UTILITIES.

The majority of cities make no annual charge for the use of sewers, although we have referred from time to time to several which do. It is generally felt that it is to the advantage of the city as a whole that all buildings be connected to the sewers as a matter of sanitation, Besides, there is comparatively little cost attached to the operation and maintenance of sewers.

That the same ideas should be applied to water service is not so generally maintained, however, and yet a few cities furnish water, or some water, free for domestic consumption, and the majority make no charge, even on the books, for that used in public buildings and for other public purposes. In New Orleans, each house must be furnished free as much water as is needed for bathroom flushtanks and other sanitary purposes, assumed arbitrarily at 1,000 gallons per capita per quarter. Here the same idea is the basis.

But in Santa Rosa, as described elsewhere in this issue, the city furnishes about 50 gallons per capita per day to all residences free of charge. This is much more than is necessary for sanitation, or even for all legitimate household purposes. It is practically free water, with a generous limit to restrict waste. Water is a necessity: but so is artificial light—necessary for safety at the ends of the short winter days, at least. Why not free light in residences? Working men and girls who live far from their places of work must ride—so why not free passage on street cars?

This is not merely an exercise of imagination. Even in conservative old Massachusetts, a bill was introduced in the Legislature a few weeks ago giving a city of that state power to purchase the street railway system and operate

it, charging no fares. There are indications in several recent developments that trial may be made in this country, before very long, of public utilities of various kinds operated at the expense of the taxpayers for the free use of all citizens.

MUNICIPAL AID FOR PRIVATE PLUMBING.

The report for 1918, of the Division of Health of Toledo, Ohio, contained two recommendations that are especially intended to aid the poorer property owners in observing the laws requiring proper sanitation in their buildings. One of these urges a much simpler system of plumbing, stating that the surgeon of the United States Public Health Service, who made a health survey of the city in 1916, had called attention to the injustice of the elaborate system required under the present plumbing code. He submitted a simplified system of plumbing for small houses which would insure adequate and safe means of carrying sewage from the house to the sewer, and which at the same time the already overburdened small property owner could install at reasonable cost.

The other recommendation was that the city create a revolving fund, the object of which would be to asist persons of moderate means to install sanitary plumbing including the connection from the house to the sewer, the cost so paid being made a lien against the property, to be repaid by the owner in annual installments. As is the case with nearly all health boards, probably, that of Toledo has realized that to require certain owners of the smaller class of houses to install and make immediate payment on a complete system of modern plumbing is a hardship, which in some cases might even cause the owner to lose his property. The use of a fund in the control of the bureau or department of health, to be used in this way, would seem to furnish a means of meeting this situation and would probably result in fewer instances of the department refraining from enforcing regulations or ordinances because of pity for the owner.

LOS ANGELES SEWERAGE

Operation of Inhoff Tanks and Other Types of Sewage Treatment Plants, Purchasing Sewer Pipes, Measuring Sewage Flow, Testing Flush Tanks and General Sewer Maintenance.

In his report for the fiscal year 1917-1918, to city engineer A. C. Hansen, the engineer of sewers of Los Angeles, Cal., W. T. Knowlton, makes brief mention of several sewage treatment plans and plants for the several sections of the city, among which the following are perhaps the most interesting.

Imhoff Tanks.—In 1916, the city installed two Imhoff tanks at the Seeley Flats Playground camp. These tanks have given satisfactory operation, and the effluent therefrom receives a sub-surface disposal. During the past year the sewage from the field house of the golf links and the sewage from the buildings in the vicinity of the zoo in Griffith Park have been treated in two Imhoff tanks, each of which was designed by this department for a capacity of 300 persons. At the present time the sewage flow in the tank at the field house has about reached this limit, although the plant is giving satisfaction.

Recently the department has prepared plans for the construction of an Imhoff tank for the Los Feliz detention hospital, and at the present time this plant is being constructed. The capacity of this plant has been designed for a population of 100 persons, and the effluent from the tank is planned to be discharged through a system of sub-surface filters, similar to the disposal in use at Griffith Park.

Other Types of Sewage Treatment.—The experience which other sections of the country have encountered when sewage treatment plans have been proposed, has been found to occur likewise in this city. Reference in this connection is made to the proposed installation of sedimentation tanks of the so-called Skeats type. This type consists of septic treatment of the sewage in long narrow tanks designed to have a very low velocity and a retention period of 24 hours. The sewage is first conveyed through septic chambers, thence through contact filters, and finally passes over a series of trays placed one below the other. The effect of this construction is claimed by the promotors to nitrify the effluent from the contact filter. It has further been claimed that this method of treatment will eliminate all solid matter. In order that an examination might be made of tanks which embody the features above described, the writer has visited several places in southern California where it was claimed the process was in use. In no case, however, was the discharge found in a stable condition. There seems to be a question whether this method could produce the results obtained by the installation of Imhoff tanks at as low a cost.

The matter of removing solid matter from sewage by installation of screens has also been considered this past year, and recently a study was made in conjunction with the Department of Substructures as to the efficiency of the Riensch-Wurl screen in use at Long Beach. The results of this examination indicated that the screen did not remove more than 20 per cent of the solids from the sewage on the days that the tests were made.

Before leaving this matter of other methods of sewage treatment, it should be noted that the Imhoff tank which was installed by this department and has been in use in East Wilmington for about two and one-half years has given very satisfactory results. No odors or nuisance of any kind have occurred at the plant and the condition of the effluent has been good. The sludge has been removed from the tank at intervals of three or four months' time, and, after drying, has been used for fertilizing purposes.

Concerning sewer construction, Mr. Knowlton reported as follows

Sewer Pipes.—At the beginning of this fiscal year, the department made arrangements to provide for the pipe to be used in the construction of sewers in accordance with instructions from the Council. The method used consisted in obtaining bids from the manufacturers of both clay and cement pipe for the furnishing of the pipe required for each sewer, the pipe specified in the lowest bid to be used. The proposals submitted by these manufacturers stated that the price thereof would be in effect for a period of nine months from the date of the proposals. These bids were for pipe made in accordance with specifications adopted by the city of Los Angeles for the construction of sewers on which bids were received. It was further provided that if 51 per cent of the frontage which would be assessed for the sewer

should petition for either cement or clay pipe, the proceedings would be drafted in accordance therewith.

In order that bids for the construction of cement pipe sewers could properly be received, it became necessary to prepare new specifications for the construction of sewers in which cement sewer pipe would be used. Specifications for cement pipe, which had been adopted by the Council in June, 1917, were inapplicable for the reason that the state law required such specifications to be furnished by the city engineer. In preparing new specifications, the department made an exhaustive study of the matter of cement pipe as used in other cities of the country, and as recommended for use by the American Society for Testing Materials. These specifications covered the use of both clay and cement pipe, and were adopted February 6, 1918. On account of proposed changes since this date, relating to the design and other details required of both of these pipes, a later set of specifications has recently been prepared, embracing several features which will conform with recent recommendations of the American Society for Testing Materials, which society probably represents the best practice in this country. In this connection it has been found that the different tests required of both clay and cement pipes have caused considerable local discussion as to these requirements.

Sewage Flow Records.—To assist in the design of sewage disposal at the harbor, an automatic recording instrument has been used in the lower manholes of the several outfall sewers, which will enable the department the have a continuous record of the sewage flow. The amount of flow treated at the East Wilmington plant has an average of about 160,000 gallons per day.

Sewer Maintenance.—There are 931 miles of house sewers in the 362 square miles of the city, in connection with which are 3,132 flush tanks and 975 flushing manholes. The work of flushing, cleaning, repairing and inspection is done by eight sewer flushers, each in an assigned district. Six of these use automobiles. Each flusher makes daily reports of the tanks flushed. During the year they made 68,272 inspections of flush tanks.

Four gangs were employed regularly on maintenance and reconstruction work. Three small motor trucks and one horse and wagon have been used for transportation of men and materials. During the year there were 93 stoppages of sewers, 84 of which were caused by roots. (An average of one stoppage per hundred miles of sewer from all causes other than roots appears to us to be a remarkably good record.) Changes were made in the elevation of 772 manhole covers. Cleaning services were given to 18,506 culverts and catch basins.

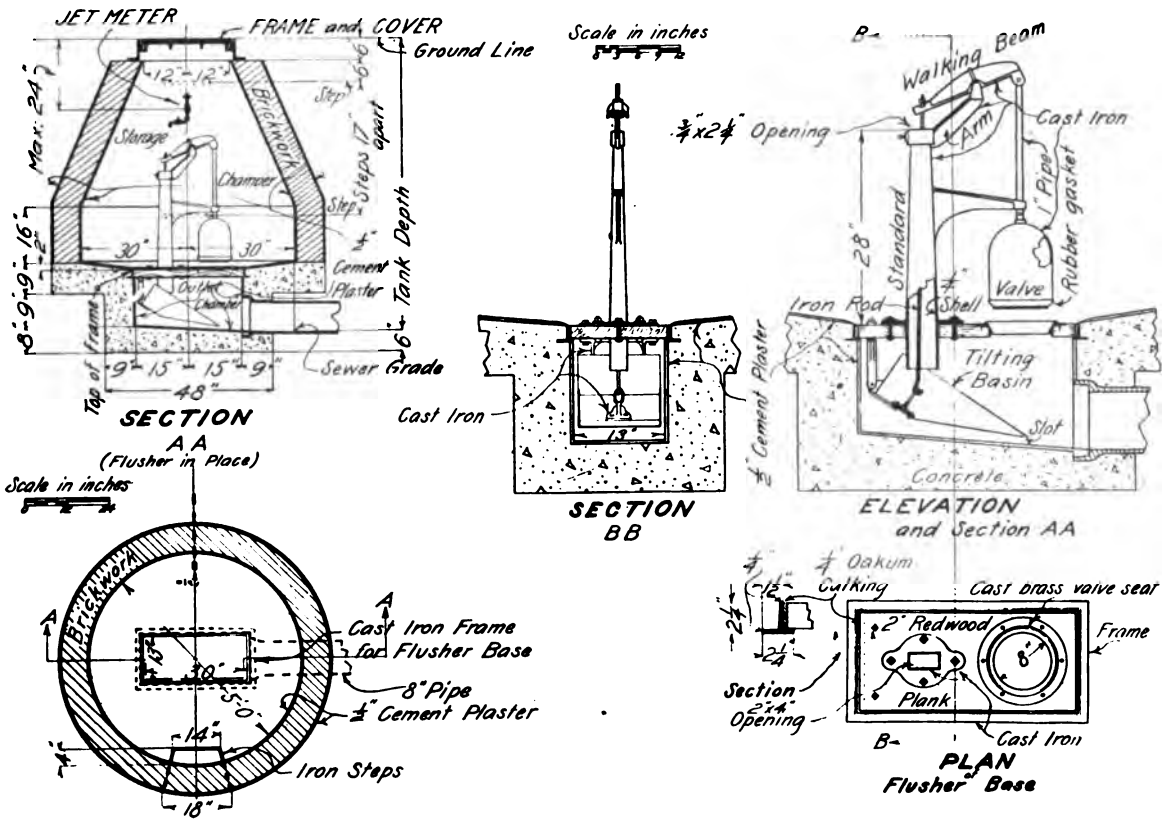
The use of automobiles and trucks permitted the department to reduce the maintenance force by three laborers, one sewer flusher, and one one-horse team and wagon.

TESTING A NEW FLUSH TANK.

By W. T. KNOWLTON.*

In the early part of 1917 the attention of the writer was called to a special type of sewer flusher, the principle feature of which was an automatic arrangement whereby the contents of a flushing chamber, when filled with water to a certain height, would discharge rapidly through an eight-inch opening in the bottom of the chamber directly into the sewer. Also the construction of this flush tank required no excavation below the level of the sewer into which it discharged. The city engineer early in 1918 recommended to the city council that bids be receved for this type of tank in competition with that which had previously been the standard in the city; arranging with the manufacturers of the tank to install one for demonstration purposes in a manhole at the head of one of the lateral sewers which has been operating

*This description of experiments, conducted since the writing of the annual report, has been prepared for Municipal Journal and Public Works by Mr. Knowlton, the engineer of sewers.

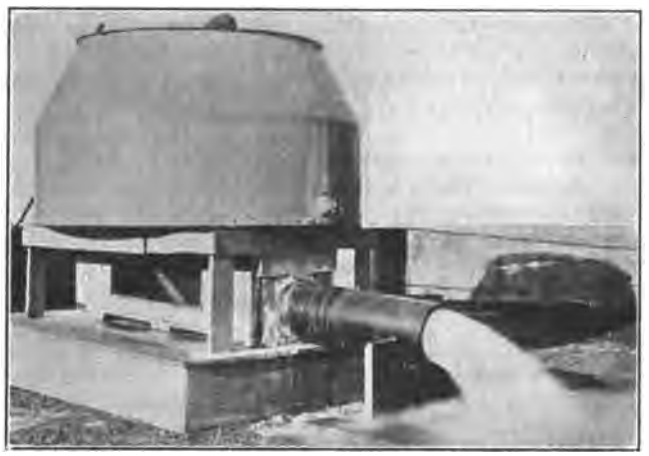


DETAILS OF FLUSH TANK AND FLUSHING APPARATUS.

satisfactorily for eighteen months. In February, 1918, the city engineer was instructed by the city council to receive bids on this as well as the older siphon, and contracts for a few of the new type were let, but on account of war conditions final arrangements for using any of them was postponed.

In the latter part of 1918, the writer, thinking it desirable that a test of the new flusher should be made in order to obtain results under conditions as nearly as possible similar to the working conditions under which the flusher would be used, set up a full-sized flusher, but installed in a steel tank instead of a brick one and with a wooden base with a glass plate for inspection in place of the concrete substructure of the flush tank. The dimensions of this tank were the same as the inside dimensions of the brick flush tank shown on the accompanying plan. The operating mechanism of the flushing apparatus is shown on the same plan.

The sewer is extended as a chamber two feet and a half long, which forms a well hole or outlet chamber in the bottom of the flush tank. This chamber is constructed of concrete and is covered with a wooden base plate that supports a hollow iron standard which is bolted to



FLUSH TANK DISCHARGING DURING TEST.

it. This plate also contains an eight-inch opening lined with a cast brass valve seat, which is closed by a hollow cast iron valve carrying a rubber gasket where it rests in the valve seat. An arm carried by the hollow iron standard supports a walking beam, at one end of which is a rod which carries at its lower end the hollow valve. Another rod attached to the other end of the walking beam passes through the hollow standard and is attached at its lower end to a tilting basin. The weight of the valve is sufficient to hold it in its seat, supporting the tilting basin by means of the walking beam and rod. The tank above the plank floor is filled through a jet meter. When the water has reached the top of the hollow standard, additional water entering the tank overflows into the tilting basin, which is made of either galvanized iron or copper. When a sufficient amount has flowed into the tilting basin, the basin drops to the bottom of the outlet chamber, pulling the valve from the seat and allowing the water in the tank to rush into the sewer. The valve, being hollow, floats in the water until the tank is nearly empty, when it closes by its own weight, the action being similar to that of the valve in the flushing tank of a water closet. The specifications under which this flushing apparatus was purchased require that the tilting basin shall tip when not more than ten gallons has entered it and that the tank shall automatically discharge its contents within a period of not more than thirty seconds and that immediately thereafter the storage chamber shall again become water-tight.

This apparatus was placed in the steel tank above ground as before described and was tested, the operation of the tilting basin being visible through the glass plate. The tank discharged 297 gallons through the eight-inch outlet pipe in 21 seconds in five tests and 22 seconds in the sixth test. This gives a rate of discharge of 14.1 gallons per second in five tests and 13.5 gallons in one test. This is from two to three and a half times as rapid a discharge as was obtained with the type of flushing tanks previously used.

This leads to the question whether it is necessary to have so high a rate of discharge from a sewer flush tank. In investigating the reports and discussions made in connection with the study of flush tanks, the writer has noted that about twenty-one years ago, when a report by Professor H. N. Ogden, of Ithaca, N. Y., was discussed at a meeting of the American Society of Civil Engineers, one member considered that a discharge of at least ten gallons per second was necessary for proper flushing effects. The actual effect of the much greater force produced by this discharge has possibly not received the attention it might have had, and on this account the writer feels that a closer study of the situation could be made to advantage. Although the cost of this flushing apparatus and tank was $30 more than those previously used by the city, it was estimated that if comparison be made between tanks of equal discharging capacity, the tank herein described would in reality be the cheaper, and the city engineer was instructed to use the new tank for all future sewer construction.

SANTA ROSA'S SEWERAGE AND WATER SUPPLY.

Santa Rosa, California, has a population of about 11,000. In 1893, the city issued $165,000 of bonds for installing a municipal water works system, and in 1905 issued $72,500 additional for improving the supply; $5,625 of bonds to be paid off yearly. In 1905 there were also issued bonds for $72,500 for installing and improving the sewerage system.

The water supply system, besides mains, includes a pumping station and reservoir, the pumping plant being driven by electric motors and drawing water from wells. There are about 36 miles of mains, 2,137 residential consumers, 293 business connections, and fire and other connections bringing the total number to 2,602, 100 of which are not in use. Not only is water furnished free to city departments, churches and schools, but each dwelling is allowed 10,000 gallons a month free of charge, all such services being metered. The receipts from the 2,137 residential consumers in the fiscal year 1917-1918 were $1,746, or about 81 cents per connection, the rate being 25 cents per 1,000 gallons. The receipts from commercial rates were $3,643. The expense of operation was $15,891; in addition to which interest and redemption of bonds required $10,651. The bond expenses were provided for by taxes; the deficit in operation was met by transfer from other funds. There was a total transfer from one fund to another during the year of $23,547.

Sewage is disposed of at a sewage farm, from which there was sold last year $710 worth of grain hay, $1,041 worth of alfalfa hay and $40 worth of wood. Hogs also are raised at the farm, and there is an incinerator there. The farm contains 108 acres of land, which cost $43,600. The incinerator is valued at $2,000, and the buildings and sewage disposal equipment at $9,000. Hogs were sold last year for a total of $626. Also $568 was received for pasturage. As against the total income of $2,986, there was an expense at the farm of $1,175, of which

the largest items were $600 salary of farmer, $260 for seed grain, $146 for feed grain, $212 for baling hay, $295 for hog pens, $100 for purchase of 9 hogs and $140 for a farm wagon.

AIR-LIFT ARTESIAN WELL

By JOHN OLIPHANT.*

The city of Clinton, Iowa, is provided with water for domestic and public purposes by the Clinton Water Works Company, a private corporation, of which W. L. Meager is superintendent. The supply is secured from some half dozen wells, having a surface flow of limited volume. These are connected so as to flow into a surface reservoir, or they may be direct connected to mains by means of suction pumps.

Experience showed that, when suction was resorted to, the supply was insufficient for the summer heat load or an extended fire demand. Three of the wells were therefore connected with an air-lift system arranged to discharge into the reservoir, using the suction piping as a gravity flow line. A suitable arrangement of valves is provided to permit this flow from the wells to the reservoir while the service pumps draw their supply from the reservoir by suction. By this arrangement, the water supply from these three wells was more than doubled.

The photograph shows one of the 8-inch wells which had a natural artesian flow of about one hundred and fifty gallons per minute. When under suction from the pumps, the pull-down was twenty feet, increasing the flow to five hundred gallons per minute. When this well was connected up for operation under the air-lift, its production was increased to one thousand and thirty-five gallons per minute, the pumping head being fifty feet below the surface. The other two wells, connected up in the same manner, showed a proportionate increase. An umbrella head was placed on the well, permitting the forced flow to discharge into the concrete basin, from which the water was conducted by gravity through the suction line to the reservoir.

*Chief engineer of Pneumatic Pumping Department, Sullivan Machinery Company.

BASIN SURROUNDING 8-INCH WELL.
Umbrella head on top of well casing is seen above the top of the basin.

These wells are handled by means of an air-lift pump, suspended on a 2-inch air line in the 8-inch casing. The air for operating the wells is supplied by a straight-line simple steam and compound air compressor, having a capacity of 558 cubic feet of free air per minute. The installation was effected in a simple and economical manner, piping the air from the receiver to and into the wells. On ordinary service, the pumps secure sufficient supply by direct suction. When an increase is demanded by the summer domestic requirements or by fire, it is merely necessary to start the compressor, throw a few valves, and the supply from the wells is more than doubled.

COMMUNITY HEATING OF DWELLINGS

Economy, Cleanliness and Convenience of Central Station Heating as Compared with House Furnaces—Heating as the Prime Object and Electric Current as the By-Product.

In many branches of industry it is the boast that nothing is wasted. As illustrations we have the utilization of "every part of the pig except the squeal" by the packing houses, the working over of the tailings of stamp mills, the vast number of products derived from petroleum and coal tar. But in the operation of steaming plants, only a small percentage of the available energy is utilized. Mechanical ingenuity has apparently reached almost its limit in the procuring of mechanical horsepower or kilowatt-hour at the switchboard for the least possible evaporative cost. And yet, with units of the highest type and largest capacity, little more than 15 per cent of the heat of the fuel can be converted into a salable product as power in the form of electric energy, while many installations do not deliver more than 6 per cent. The Bureau of Mines of the Department of the Interior advocates, as a partial remedy of this wasting of energy, the combining of a central-station heating system with steam power plants. The following is condensed from a publication by the bureau.

Central-station heating affords an opportunity for a great saving in the total fuel consumed by a community, and at the same time for furnishing electric energy in greater quantity and at a less cost than otherwise. To make such service a success, however, some important factors must be considered and better methods and designs must be worked out. In the late seventies the first central-station heating plant was put in service at Lockport, N. Y. Since that time many others have been installed with varying degrees of success. Much has been done in the development of methods, the perfecting of devices, and the working out of rate schedules and other commercial problems. But in certain directions a great deal of room for improvement remains. An attempt to get information from operating companies on various features of their plants and on operation and maintenance costs was unsuccessful. Had some of these companies responded, specific data might be given instead of the assumptions and generalities on which this paper is based.

BASIS FOR HEATING CHARGES.

The test of any such project is its ability to furnish a satisfactory service for the price that may be obtained. This price is and should be competitive, but unless all of the factors entering the problem are considered at their face value, the results will be misleading. One of the most important factors in the sale of steam for heat-

ing is the economy with which the steam will be used. The early method of charging for the service was based on the amount of radiation installed at an agreed rate per square foot per season. It is easy to predict the fate of the gas or electric company that had to sell its product on that basis to-day. Nevertheless, some of those heating companies survived. A later method was based on the cubic feet of space heated; this was practically the same thing in another form. The present method, and the only proper one, is to meter the condensation and to charge the consumer for the heat supplied as he is charged for any other commodity, leaving him to exercise or not the same economy in the use of the steam that he did in the use of the coal that he formerly bought.

As regards selling steam on the basis of square foot of radiation, it is interesting to note that, although many of the early companies charged a rate of only 20 cents a square foot for a season of 7 to 8 months, the fuel cost of energizing such radiation for a period of only 6 months (180 24-hour days), with an over-all efficiency of 50 per cent in generation and transmission, steam at atmospheric pressure and a room temperature of 70° F., would be from 10 cents to 15 cents with coal at $1 a ton. As few places get their coal at that price, it is easy to see why these heating companies failed. Many electric companies claim a cost of less than 1 cent per kilowatt hour at the switchboard; the public, however, except a few large consumers, pays three to ten times that amount for what it uses. Steam heating can never carry such an excess as that, but there must be a margin for operation, distribution, overhead costs and profit. An attempt will be made in the following analysis to determine what difference exists between the cost of central-station service and of private heating to cover those items.

VALUE OF CLEANLINESS AND CONVENIENCE.

It has been shown above that the average fuel cost of supplying radiation under the conditions named will be about 10 cents to 15 cents a square foot for a season of 8 months with coal at $1 a ton. The cost can be readily computed with coal at any other price. From a series of tests at the engineering experiment station of the University of Illinois, the plant efficiencies for such equipment with the fuels named were as follows:

Plant Efficiencies for Five Fuels.

Fuel.	Average efficiency (per cent).
Illinois coal	48.86
Pocahontas coal	50.20
Anthracite coal	54.00
Gas-house coke	59.63
Solvay coke	61.73

The efficiencies given for Illinois coal are no doubt somewhat higher than will be maintained in practice by the average householder for an entire season. Based on the relative average heating values of the fuels named and with the efficiencies above given, the prices at which the cost of heat would be equalized to the consumer are as follows:

Data on Four Types of Coals.

Fuel.	B. t. u. per pound as fired, average.	Heat absorbed, total value, per cent efficiency.	Cost per million B. t. u., cents.	Prices at which values equalize.
Illinois coal	12,000	5,863	8.53	$1.00
Pocahontas coal	14,750	7,400	6.75	1.26
Anthracite	12,700	6,828	7.28	1.17
Coke	12,000	7,200	7.00	1.22

Thus it appears that with Illinois coal at $1 per ton we could afford to pay $1.26 for Pocahontas, $1.17 for anthracite, and $1.22 for coke. The Illinois coal would therefore be in demand if it were not for other considerations than the cost of the heat. Some cities have smoke ordinances that make it nearly, if not quite, impossible for householders to burn Illinois coal. It also requires more labor to keep up the fires, remove ashes and clinkers, and keep the heating surfaces free from soot. All things considered, Pocahontas coal, anthracite and coke are in demand at one and one-half to three times the cost of Illinois coal.

These differences represent charges against dirt, smoke and excess labor. In other words, they are a contribution to cleanliness and convenience. Taking the Illinois coal at $1 a ton, with a heat value of 12,000 B. t. u. and 49 per cent average efficiency, the cost of energizing a square foot of radiation for one hundred and eighty 24-hour days will be slightly higher than for the central station mentioned above, at which the overall efficiency of generation and distribution was taken at 50 per cent. The fuel costs for the heat are therefore about the same, whether furnished by the private plant or from a central station with the same coal at the same price.

Value of Central-Station Service.—However, there are these differences: The central station can work at a higher sustained efficiency, it can produce electric current as a by-product with only a small loss of heat generated, and it eliminates all of the objectionable features of a private plant.

The development of equipment and methods of operation in the boiler room of the modern power plant leave but little to be accomplished there. Soft coal may be had under contract in Wisconsin at prices ranging from $2.50 to $3.50 a ton on track. It can be burned at an overall efficiency of more than 70 per cent and the product is heat with steam as a medium of transmission. Served in this manner through a distribution system, the heat has a value equivalent to the total cost of all items included in the operation of a private plant plus a considerable allowance for greater convenience and perfect cleanliness, and it should be so estimated in all computations on which costs and rates are based. Whether or not it is exhaust steam in whole or in part has no bearing on the case; any allowance in that direction should affect the price of current and not the cost or the value of the steam. The steam should be considered the prime requisite, with any output of incidentally derived current as the by-product; it will then stand or fall on its own merits, which is the only substantial measurement of its value. The reasons on which this argument is based will be given later.

As regards the generation and the transmission costs and margins, with coal at $3 a ton and an overall efficiency in the plant of 70 per cent, the steam can be delivered at a fuel cost of approximately 30 cents a square foot of radiation served. This allows 20 per cent for loss in transmission, a figure considerably higher than that found in practice, as evidenced by a report in Bulletin 40 of the Bureau of Mines, where this loss is given as 4 to 12 per cent. The same coal will cost the private user about $4 a ton delivered at his premises, and his fuel cost for the same amount of heat will therefore be not less than 40 cents. But he still has the smoke, dirt and labor inseparable from the use of soft coal in such equipment as he uses. How much is the elimination of these objectionable items worth? Based on the relative costs of the soft coal and those substitutes—anthracite and coke—which most nearly accomplish the desired end, so far as smoke and dirt are concerned, it is worth from 100 to 150 per cent more than the estimated cost of the heat as computed at 40 cents, making the real value 80 cents to $1.20 a square foot a season. These values may seem high, but when the economy that is practiced in the use of hard coal at $8 to $9 per ton

is considered, they are probably not far from correct. Storm windows are in evidence at the first frost, ventilation is sacrificed, and no space is heated that is not absolutely needed.

The use of fuel of higher grade eliminates nearly all of the smoke, part of the dirt, and some of the labor; but it is still necessary to provide and maintain a furnace and furnace room, and coal storage, to buy coal, haul out ashes, and do the firing and cleaning. These items may be estimated to cost approximately 50 per cent of the value of the soft coal burned. Assuming that the investment is already made in the private plant, we can make no charge against that except for repairs; these can be neglected, as can also any charge for space occupied by equipment, coal or ashes. Adding the 50 per cent, or 20 cents a square foot as determined above, to each of the costs for the various fuels, gives us rates of 60 cents, $1, and $1.40, respectively, for Illinois coal, anthracite, and coke.

The central station can deliver the heat for a fuel cost of 30 cents, thus leaving margins of 30 cents, 70 cents, and $1.10 to cover labor, maintenance, overhead charges, transmission, and profits. In addition the station has eliminated every objectionable feature of the service and made it a convenience instead of a nuisance. It is a fact worthy of note that central-station heating plants are most numerous where coal is abundant and cheap, as in Pennsylvannia, Ohio, Indiana, and Illinois. This confirms the deductions to be made from the preceding statements, namely, that the elimination of the smoke, dirt, and disagreeable labor are of more value in some cases than the fuel cost of the heat. In the localities cited, this elimination is essentially what the consumer is paying for. The fuel is so convenient and cheap that the central station can offer no inducements in the way of economy and must make its campaign for consumers on the basis of better service and the elimination of all objectionable features.

As stated before, a number of the old companies did survive the period of 20-cent rates; coal was cheap and they had a considerable quantity of exhaust steam which they discounted in making their rates, and the product of the steam—electric current—was sold at a good profit. Still, it is remarkable that they could exist with the fuel cost approximately 12 cents a square foot a season and only a margin of 8 cents left to cover all investment and operation charges.

ANOTHER METHOD OF COMPUTING COSTS.

If the problem be viewed from another angle, the cost of evaporating a given amount of water in the large public-service plant as against the small private plant may furnish a better basis for comparison. With Illinois coal at $1 a ton, the fuel cost of evaporating 1,000 pounds of water (generating 1,000 pounds of steam) should not exceed 7 cents, and in a well-designed and carefully operated plant may be as low as 6 cents. The other costs will increase this figure to about 10 cents, and with coal at $3 a ton the total cost will be about 25 cents. The private consumer can not evaporate the water any more cheaply, even with coal at the same price, and as he will have to pay more for his coal, the cost to him of evaporation will be more. Furthermore, when he only requires a little heat his efficiencies drop very low and his losses are correspondingly great.

In the former estimate of the cost of supplying 1 square foot of radiation for 180 days, a rate of emission of 2.5 B. t. u. per square foot of surface and per degree difference of temperature per hour was used. This rate shows that 1,500,000 B. t. u. will be required to energize 1 square foot of radiation for the 180-day period. In evaporating 1,000 pounds of water there will be a heat transfer of approximately 1,000,000 B. t. u., at a cost of 25 cents with coal at $3 per ton. From these figures it evidently will cost 38 to 40 cents to evaporate the water for each square foot of radiation supplied. To this figure must be added all the investment, operation, and other charges on the plant and distribution system. These can only be approximated in a general estimate, but they will probably equal the fuel cost, bringing the total up to 75 cents or 80 cents a square foot a season. The reader should bear in mind that in the computations made on the quantity of heat emitted the radiation was assumed to be active for the entire period. This will not necessarily hold in practice, and less heat will be required than the amount charged in this discussion. It makes little difference, however, as the lessening will be of about the same amount whether the radiation system is heated privately or from a public-service main.

Rates for Steam.—From schedules of rates in 28 cities of 25,000 to 40,000 inhabitants, covering many of the middle states and ranging in latitude from Michigan and New York to Georgia and Alabama, the highest minimum is $1.50 per 1,000 pounds of steam at Peoria, Ill., and the lowest for maximum consumption is $0.3105, at St. Joseph, Mo. The lowest minimum consumption rate is 54 cents at Penn Yan and Geneva, N. Y., and the rate at these points for maximum consumption is 46.35 cents. The average minimum and maximum rates for the 28 cities, on quantities of 4,000 pounds or less and 300,000 pounds or more per month, are 76.40 cents and 45.33 cents respectively.

Although a study of these rates shows an entire lack of uniformity in the methods of their deduction, the averages confirm in general the costs established herein for furnishing 1,000 pounds of steam. In about half of the schedules mentioned there is a demand charge of $3 a month minimum on all buildings having a capacity of 25,000 cubic feet space or less, and of 12 cents per 1,000 cubic feet on all buildings having more than 25,000 cubic feet.

ECONOMY IN USE OF STEAM.

From the foregoing statement it is evident that economy in the use of steam from a central station is just as important as in the use of coal burned privately. Will the consumer practice such economy? Under meter it may be assumed he will; under flat rates he will not.

The quantity of heat necessary to supply 1 square foot of radiation for a season is probably less than the estimate already given in this paper. Although the heating season is one to two months longer than the period named, there are many days in the early fall and late spring when little or no heat is required. At such times the consumer can reduce his active radiation to any amount desired with less trouble than he can allow his fire to go out and be rekindled. He can also have a little heat in the morning and shut it off for the rest of the day if he desires. A proper demand charge will protect the central station at such times. The station has a decided advantage also, in that the boiler capacity in service can be adjusted to the load and maximum efficiency can thus be maintained.

As with some electric schedules, many rates for steam throw a burden on the small consumer by forcing him to help pay for the large consumer's service. In the case of steam, no consumer should be given service for less than a profitable rate. In rates for electric service there is some justification for the apparent discrimination as between the large and the small consumers. The

former may make their heaviest demands at times when the load is otherwise small and thus increase the station load factor. In a central-station steam plant the load varies but little during the entire day; the demands for steam go up and down with the changes of wind and temperature, but such changes are gradual and give ample time for controlling the operation of the plant so that the highest possible economy can be realized. Daily peaks are almost negligible.

EXHAUST STEAM.

Thus far exhaust steam has not been considered, because there is no difference between it and live steam at the same pressure, and any exhaust steam that may become available for distribution costs just as much and is worth just as much for heating as though a part of its original energy had not been converted into useful work. In a combined plant, the product resulting from such conversion—usually electric current—should be considered the by-product.

Where the heating load is large enough to entirely submerge the power load, there will be no peaks in the boiler room through variations in the latter. The power requirements may vary from zero to maximum and the firemen will not know it unless some one tells them or they consult the records. When the engines are exhausting their maximum into the heating system, the reducing valves will automatically cut the supply of live steam to the required amount; when the power load is a minimum they will open and supply live steam to meet the requirements.

CORRELATION OF LOADS.

The relations of loads have an important bearing on the subject of central-station heating. When the heating load is made large enough to give constant conditions in the boiler room, the efficiency there is decidedly increased and the power output becomes a matter of secondary importance as far as cost of operation is concerned. Although for commercial reasons, the keeping of the station load factor for power as high as possible is desirable, peaks and variations of any magnitude within the range of the boiler capacity can be handled with a minimum of trouble and expense.

The early efforts—and, perhaps, those of the present—sought to adjust the loads in a combined power and heating plant so that the exhaust steam, considered as a by-product, would do the greater part of the heating, as much live steam as might be necessary being introduced in severe weather. In the average central station such adjustment is practically impossible because of the wide variations in the power requirements during the day and the comparative uniformity of the heating load. In consequence, some exhaust steam is wasted during part of the day and considerable live steam is required at other times. This procedure leads to the establishment of heating service rates that are too low, and it is wrong in principle for the reason that it discounts the value of exhaust steam. Fortunately, in some of the successful plants the heating load crept up until a favorable relation existed and, had the hates been equitable, a much better showing could have been made. Where the service is good it is not difficult to book all of the business, or a satisfactory part of it, along the mains. The central station that can supply both heat and current stands a much better chance of displacing the isolated plant than the one that can bid for the current only.

In cities of medium size the same boiler capacity that can supply three to four blocks with current will heat only about one. This fact should make it comparatively easy to take on a suitable heating load within easy distance of the plant where the latter is situated favorably with regard to the district served. By a suitable heating load is meant one in which the power ceases to be a factor so far as the boiler requirements are concerned. As regards steam that has passed from a higher to a lower pressure by doing useful work in an engine, it is in a way analogous to water that is used for irrigation, navigation, or any other purpose after it has driven the wheels of a power plant. The quantity of water remains the same, and if it still has sufficient head or depth it will irrigate as much land or float as large a boat. The steam, after it has passed the engines, will do nearly as much heating as it would before. The current generated may vary from zero to maximum, with only a trifling increase in the quantity of fuel required.

For this reason the steam should be considered the prime requisite and any current produced should be considered the by-product. The latter will be cheapened somewhat by the process and a correspondingly greater number of people will be benefited by the combination. Also, the fuel will be utilized more efficiently.

HOT WATER AS HEATING MEDIUM.

Steam is most generally used as the medium for conveying the heat to the consumers, although hot water has its advocates, and in some ways it has advantages. Where hot-water radiation has already been installed it is a simple matter to put in a small heater and use the steam for heating the water instead of heating it directly by a coal fire. Nearly any kind of steam or hot-water system that a consumer may have can be satisfactorily operated from the central station mains by using the necessary devices for pressure regulation and control. All installations should have thermostatic regulation if the best economy is to be maintained.

GOOD ENGINEERING NECESSARY.

The design, materials of construction, and the methods of operation of district steam-heating plants require careful consideration by competent engineers to insure the success of each installation. Generally, the pipe lines have been iron or steel pipe, several times heavier and stronger than necessary for the pressure carried but failing rapidly by corrosion. It is a false economy to use material not permanently resistant to destructive agents. The pipe is only one item of the underground expense, and means should be devised of making it durable. The best is the cheapest where a long life with low maintenance cost is necessary to success.

The practice has been to lay the mains in the streets or alleys. This is desirable wherever possible. However in mine and mill work the mains are frequently carried considerable distances overhead. Tunnels are convenient, but their cost is generally prohibitive except in the largest cities. Our city planning should include better provision for underground services than is to be had at present. The streets are practically the same in width and surface arrangement that they were 50 years ago when gas and water were the only utilities requiring space; at present there are some six or more besides the sewers, and the number will increase.

RECOMMENDATIONS.

Based on the foregoing discussion it would appear advantageous to—

Select plant locations favorable to the district to be served.

Adopt more permanent construction materials and improved designs.

Submerge the power load entirely at all times during the heating season.

Put all consumers on meter rates with an equitable demand charge.

Run compound engines, or exhaust the turbines tandem to simple engines during the summer months.

TEMPERATURE EFFECTS ON CONCRETE RESERVOIR.

During the year 1917 the city of Newton, Mass., built an extension to what is known as the Waban Hill covered reservoir, but water was not admitted to this extension until after the winter of 1917-1918, the cold weather of which subjected the exposed concrete to unanticipated temperature changes.

The Newton water supply is obtained from underground sources, and the temperature of the water only varies some 10 degrees Fahr. during the year. A covered reservoir containing such water is therefore subjected to but slight temperature stresses, and this structure was designed with the expectation that the whole work would be completed and filled with water during one season, thus doing away with the necessity for more than a minimum allowance for expansion and contraction during construction. The work was started so late in the season of 1916 that only the greater part of the floor area and walls were completed. The reinforcement in the floor, however, distributed the contraction stresses so that only hair cracks were apparent in the winter time, and the expansion joints provided in the walls proved adequate. It was noted that some of these latter joints did not open at all, and others a substantial amount while exposed during the cold weather of the winter of 1916-1917.

The winter of 1917-1918 was of unusual severity, the thermometer on occasions registering below zero several days at a time. On January 2, 1918, the temperature of the completed sections was tested and found to be 33 degress Fahr. On the morning that this observation was taken, the temperature of the outside air was below zero Fahr. and had registered below zero Fahr. for five successive prior mornings. Although the loam filling and the groined arch roof were frozen solid, as evidenced by the frost adhering to the under side of the arches, yet no cracks were apparent in the concrete of the roof, the only effect being that the construction joints along the crown of the arches opened up sufficiently to indicate their location, but without apparent impairment of the stability of the roof.

BURIED STREETS OF SAN FRANCISCO.

A part of the city of San Francisco extends into a country of sand dunes, and the continuous shifting and irresistible progression of these dunes is one of the most serious problems that the city has to face. The dunes in many cases move across a street so as to entirely bury it and make it impassable, as shown in the accompanying illustrations.

The city has tried many remedies, but none has yet proved entirely successful. The most satisfactory one found so far is the combined use of a bulkhead and the growing of Texas grass on the sand back of it. The

FIG. 1—SAND DUNE CROSSING STREET.

FIG 2—SAND OVERTOPPING BULKHEAD AT STREET LINE.

bulkhead alone, at least carried up to the height shown in Fig. 2, does not solve the problem, but is in places buried by the drifting sand. Texas grass, when once started on the sand, seems to grow about as fast as the sand piles up, the top of the grass always projecting a little above the sand. It continues to grow in this manner even though the sand may reach a depth of eight or ten feet above the place where the grass is originally planted. With the entire building up of a section and cultivation of the land surrounding the residences, a large part of the difficulty probably will disappear; but for the present it is a problem that has not yet been satisfactorily solved and on which considerable amounts of money are being spent.

SET-BACK LINES IN NEWTON.

In his annual report for the year 1918, as city engineer of the city of Newton, Mass., Edwin H. Rogers makes brief mention of the carrying out of the policy of establishing building or set-back lines which had been adopted in the year 1917. At the end of 1918 such lines had been established on seven new streets and on portions of two old streets. The length of frontage of abutting property on which building lines were established in 1918 was 3.4 miles, making the total amount of building lines established up to that time 4.33 miles.

"The establishment of building lines on Center street, providing for a set-back of from 35 to 40 feet for a distance of a mile on each side, is a noteworthy instance of the advisability of this policy, and a similar procedure is strongly advocated for many of our existing thoroughfares with a view not only to provide streets of better appearance, but also to preclude in many cases the erection of commercial buildings on the existing street lines, thereby rendering future widenings in such places unduly expensive."

On the eight streets other than Center street, the setback was ten feet in each case, the lengths of street affected varying from a minimum of 178 feet frontage to a maximum of 2842 feet, except for Center street, on which the restriction covered 9453 feet of frontage.

TO SUPERVISE FEDERAL AID ROAD WORK.

Thomas H. MacDonald has been appointed by the Secretary of Agriculture in immediate charge of work done under the Federal Aid Road Act. Mr. MacDonald, who is now chief engineer of the Iowa State Highway Commission, will assume his new duties as soon as he can close up his work in Iowa, in the meantime keeping in close touch with the Federal Aid work. It is planned that, in the near future, he assume the position of Director of the Bureau of Public Roads made vacant by the death of Logan Waller Page. He will immediately supervise and direct all the activities of the Bureau of Public Roads under the Federal Aid Road Act, including the expenditure of the additional appropriation of $209,000,000 provided by the Post Office Appropriation Act passed a few weeks ago.

The WEEK'S NEWS

Proposed $75,000,000 Road Bonds for Texas—War Explosives for Road Work—Pennsylvania's Highway Plans—State Quarantine Law Follows Jersey Influenza Fights—New York Harbor Pollution Case Reopened—Hundreds Sick in Lansing from Water—All Metering in Niagara Falls—Electric Power Plant Census in New Jersey—Los Angeles Mayor Indicted on Vice Bribe Charge.

ROADS AND PAVEMENTS

To Vote on $75,000,000 Road Bond Issue.

Austin, Tex.—The proposed constitutional amendment to provide that the state issue $75,000,000 in bonds for the purpose of building roads in Texas has been adopted by the legislature. The resolution proposing the amendment asks that the people vote to give the authority for the issuance of the bonds and handling and disposition of proceeds therefrom is left to subsequent legislatures, as is the method of retiring the bonds.

Illinois Legislature Investigates Road Material Prices.

Springfield, Ill.—Subpoenas numbering 250 have been issued by the joint legislative committee appointed to investigate costs and profits in road construction materials. Hearings will be held here and Chicago. A number of prominent Chicago paving and cement contractors and officials of stone, terra cotta, brick and lumber companies are expected to give the committee definite information on building costs. The inquiry will include an attempt to learn whether or not profiteering exists in steel, cement, brick, plumbing and other material lines. The committee will also consider the feasibility of the state's entering upon the business of producing road materials. Senator John Dailey, of Peoria, is chairman of the committee.

TNT for Road Work.

Washington, D. C.—Ten million dollars worth of high explosives mostly consisting of TNT have been turned over by the War Department to the Department of the Interior for reconstruction purposes. It is reported that Secretary Lane, of the Interior Department, plans to use much of this material for blasting on road construction work.

State's Share in Pennsylvania Road Work.

Harrisburg, Pa.—Highway commissioner Lewis S. Sadler has issued a statement explaining the method of county cooperation in the construction of secondary roads throuhout Pennsylvania, and urging greater activities on the part of county authorities. A trans-Pennsylvania north-south and east-west highway will constitute the state's primary road system. The cost of this system will be met entirely by the state, from the sale of bonds authorized at last November's election. Its construction will give Pennsylvannia a network of permanent main highways. In order that not only the state at large, but its thousands of communities may get the benefit there will be a secondary system of roads—connected with the primary system. To secure this secondary system the commissioner says it will be necessary that every Pennsylvannia county cooperate with the commonwealth. Each Pennsylvannia county is entitled to a portion of what is called the state-aid fund. The state shares with the several counties on a 50-50 basis. The counties arrange their portion of the 50-50 expenditure as they see fit, insofar as the division between county and townships is concerned. The state will follow preferences indicated by county commissioners as to the thoroughfares on which work will be done on the state aid plan. But the total represented by what the state and the counties will spend on state-aid roads does not truly represent the total that will be spent on the construction of secondary highways. The state highway department takes the position that because the state alone is paying for the main or primary highway system, the counties themselves should be willing to put into the construction of secondary routes the money they would have spent had they been called to meet the state in cost of construction of the primary system. In other words, a county's share of the state-aid fund for the two-year period covered by the legislative appropriation may not be sufficient to do extensive construction on the secondary system. The commisssioners of that county have authority to borrow money or issue bonds as they see fit. If they use it to construct permanent roads on state highway routes then, upon completion of the thoroughfare, the state assumes the maintenance and repair. Several counties have already issued bonds for road work, a dozen counties have bond issues in prospect, and many others will if necessary borrow money with which to aid in the construction of permanent sections of secondary highways. Almost every county in the state has indicated that it will avail itself of the state-aid apportioned to it under the law.

SEWERAGE AND SANITATION

City Officials Controlled by the Quarantine Bill.

Trenton, N. J.—The senate has passed a bill to strengthen the powers of the state department of health by giving it explicit authority to close places of public assembly and resort during epidemics. The bill is intended to prevent the recurrence of such a situation as developed last fall during the influenza epidemic, when certain municipalities, including Newark and Jersey City, refused to comply with instructions from the state department of health to close such places in order to safeguard the public against the spread of the epidemic. Mayor Gillen, of Newark, it will be recalled, put the order of the state department in effect when promulgated, but subsequently modified the order, without authority from the state department, by permitting saloons to sell liquor through their side doors. The Newark mayor still later permitted some other places of public assembly to open before the quarantine had been lifted by the state department, and finally declared the quarantine lifted so far as Newark was concerned without awaiting such action by the state department. Mayor Hague, of Jersey City, also permitted the saloons to open. Efforts by the state department to obtain full compliance with the quarantine order in both cities resulted in open defiance, and when the state department consulted legal advice it learned that while the existing law apparently gave it full power to safeguard the public health, the grant of power to establish and enforce a state-wide quarantine was very doubtful, if existent at all in the law. The bill is a supplement to the act which created the state department of health. It provides that "whenever a dangerous epidemic of any communicable disease shall exist in any municipality of the state, and in its judgment such action shall be necessary to check or abate the further spread of such epidemic," that department shall have "power, by the order, and during the prevalence of such epidemic, to close all such stores, saloons, churches, schools, public and private, theatres and places of public amusement and resort in such municipality as it shall deem wise and expedient, and to prohibit public meetings and assemblies." Such order under the proposed law would be immediately effective, being published by adver-

tisement or posting and sent by registered mail to the proper municipal officials, and it is made the duty of the police of the municipality to enforce the order. In the absence of the board of that department, the president of the board is given power to act. Penalty for non-compliance by any person or establishment against which the order is directed is made $100, and each day during which the order is disobeyed is made to constitute a separate offense. Any mayor, director of a department or chief of police declining to enforce the order is made subject to a fine of $500. Provision is made for prosecuting those coming in conflict with the law, but there is no provision for its physical enforcement by the state in the case of refusal of municipal authorities to act, beyond the imposition of the fines mentioned.

Supreme Court Reopens Big Sewage Disposal Case.

New York, N. Y.—The United States Supreme Court has ordered reopening of the suit brought by the city of New York against the Passaic Valley Sewerage Commission, or as the case is legally entitled, the State of New York against the State of New Jersey. The suit was originally brought in October, 1908, to prevent the alleged pollution of the waters of New York Bay by the treated sewage of Newark and other communities included in the Passaic Valley Sewerage District. Testimony was taken from June, 1911, to June, 1913, but the case was not argued until late in 1918. The court declares that supplementary evidence is needed. It permits the defendants to take the testimony of not more than three "sanitary or engineering experts" on (1) "any practicable modification of the proposed system of sewage treatment" that would lessen the alleged pollution, and (2) on "any practicable plan of sewage disposal or treatment" applicable to New York City sewage that would lessen the pollution of the harbor. In addition (3) both parties are authorized to take evidence on the degree of pollution of the harbor. The evidence in behalf of the defendants must be in by Aug. 15, 1919. Between then and Sept. 15 the defendants may, if desired, recall in rebuttal the experts who have testified under (1) and (2) and may also offer rebuttal evidence under (3). After the new evidence is all entered, a date for further argument will be set. The evidence will be taken by James D. Maher, clerk of the United States Supreme Court, sitting as a commissioner in New York and Newark. Mr. Maher took the earlier evidence in this case.

WATER SUPPLY

Water Rate Increases Replace Liquor Revenue Loss.

Camden, N. J.—The city council water committee has decided to solve the problem of how to make good the loss of income hitherto obtained from wholesale and retail liquor licenses after the country goes dry on July 1st by increasing the water rates so that they would yield an additional revenue obtained from local liquor licenses—$125,000 a year. On the day prohibition becomes effective Camden householders will begin paying a rental of $8 for outside and kitchen hydrants. The present cost is $5. Bathroom faucet charges will jump from $3 to $4 in one-family houses. Factories will be charged twenty-five cents a day for each 1,000 feet from one to 100 gallons instead of twenty cents as at present.

Water Causes Sickness of Hundreds.

Lansing, Mich.—Hundreds of people in all sections of the city have been made sick by the water supply. Contamination of the entire under strata of water which supplies the wells of the city water plant is the cause, according to the conclusion which has been reached by Major E. D. Rich, state sanitary engineer, based on the results of investigations and laboratory tests which have been going on night and day since the bad condition of the water was first discovered. Laboratory tests of the water from every part of the city, made in the laboratories of the state health department, showed that it was all unsafe to use. Tests of water taken direct from the different pumping stations showed it in every case to be of a dangerous character. State and city officials ordered the people to use only boiled or distilled water for drinking and cooking purposes. Emergency apparatus was immediately installed for treatment. As only a limited amount of water can be treated at a time, Guy C. Crane, manager of the city water plant, declared that the strictest economy in the use of city water for washing and all other general purposes would have to be observed. Practically all the water used came from the Pennsylvania avenue and central stations, amounting to less than 6,000,000 gallons every 24 hours, which is far short of the usual demands. So many were stricken that some departments in local factories had to shut down.

All Connections to Be Metered.

Niagara Falls, N. Y.—Following a resolution of city council, beginning June 1st, water will be sold by the bureau of water through meter only. It therefore will be necessary for all consumers now on flat rate to have a meter installed not later than that date. Meters will be furnished and installed by the city water departments at the actual cost of meter and installation. The city has on hand about 800 meters and until this supply is exhausted, the price of meter and installation will be $10.

STREET LIGHTING AND POWER

Commission Grants Increased Rates.

Noblesville, Ind.—The public service commission has issued an order authorizing the Indiana Gas Light Company, of Noblesville, to increase, for the period between March 21 and January 1, 1920, gas rates from $1.10 to $1.35 a 1,000 cubic feet for the first 5,000 cubic feet; from 85 cents to $1.25 a 1,000 for the next 50,000, and from 75 cents to $1.10 a 1,000 for consumption in excess of 55,000 cubic feet. The company supplies Noblesville, Tipton, Atlanta, Cicero and neighborhoods. It does not manufacture gas, but gets its supply from the Central Indiana Gas Company, of Muncie, which latter company produces artificial gas and also brings gas to Indiana from the natural fields in West Virginia. Recently the commission granted the Central Indiana company authority to increase its charge to the Noblesville company from 40 cents to 60 cents a 1,000 cubic feet of gas. In granting the Noblesville company the increased rates the commission yielded only partly to the petition of the company, declaring in its order that "the commission cannot fix rates which will yield income sufficient to meet fixed charges on $388,000 of bonds as compared with the $269,000 estimated value of the property." The commission estimated that the rates granted temporarily will yield the company 6½ per cent on the $269,000 tentative value of the company. "The rates established in this order," reads the document, "are based on the rendition of adequate service, and this petitioner will be required to use every means to maintain such service."

Central Electric Plants in New Jersey.

Washington, D. C.—Preliminary figures of the forthcoming quinquennial report on the central electric light and power stations of the state of New Jersey have been given out by the Bureau of the Census, Department of Commerce. The statistics relate to the years ending Dec. 31, 1917, 1912 and 1907, and cover both commercial and municipal plants. They do not, however, cover electric plants operated by factories, hotels, etc., which generate current for their own consumption; those operated by the federal Government and state institutions; and those that were idle or in course of construction. The report shows a pronounced growth in the amount of business done by the electric light and power stations. Their total income in 1917 was $23,480,320, representing an increase of 114.5 per cent since 1912, as compared with an increase of 83.9 per cent during the period 1907-1912. The income from electric service alone in 1917 was $20,188,244, an increase of 90.7 per cent for the

later five-year period, as against 79.1 per cent for the earlier. The total output of the stations was 781,230,790 kilowatt hours, an increase of 103.5 per cent between 1912 and 1917, as against 173.2 per cent for the preceding five years. The total expenses, including salaries and wages, amounted to $18,760,138, an increase of 100.7 per cent for the period 1912-1917, as compared with 103.3 per cent for the preceding five years. The relative increase in the amount of current generated was greater at each of the five-year periods than the increase in the income for electric service or in that for the total expenses. The stations employed 5,065 persons, to whom were paid salaries and wages aggregating $4,821,852. The rates of increase in the number of persons employed were 69.5 per cent for the period 1912-1917 and 69.9 per cent for the preceding five years, but the rates of increase in salaries and wages were considerably greater—94.5 per cent and 80.9 per cent for the later and earlier periods, respectively. The total primary horsepower, 96 per cent of which was derived from steam engines, was 367,743 in 1917, an increase of 53.5 per cent during the period 1912-1917, as against 155.9 per cent for the preceding five years. The kilowatt capacity of the dynamos was 249,521, an increase of 39 per cent between 1912 and 1917, compared with 154.3 per cent between 1907 and 1912. The horsepower of the stationary motors served was 262,858, an increase of 209.2 per cent over 1912, as against 208 per cent for the preceding five years. As in the cases of most of the states, the number of arc lamps used for street lighting shows a decrease, while a pronounced increase appears in incandescent lamps.

GOVERNMENT AND FINANCE

Former Manager Waite Meets German Burgomeisters.

Dayton, O.—Henry H. Waite, formerly city manager of Dayton and the leading figure among the city managers, resigned a year ago to enter the army as a colonel of engineers. He has just returned from France. Waite was assigned to deal with German municipal authorities in the areas taken by the American Army of Occupation, and was one of the few Americans who reached the Rhine before the German armies left. Knowing that German cities had for years been administered by professional chief administratives like himself, he was interested in putting them through their paces. He reports:

The German municipal authorities were extraordinarily efficient. They often gave us in a single day data which we requested and which we assumed would take weeks to compile. They had their facts always on tap and knew far more about the condition of their people than American municipal officials usually consider within the scope of their interests. Beyond all doubt the German mayor knows his job.

But the Germans don't have the city-manager plan. The resemblance is utterly superficial. The whole democratic spirit of our manager cities is missing. I talked with labor radicals, and apparently they had not even thought of the idea of electing friendly councilmen under the new democratic regime, and thereby keeping the magistrate under continuous and flexible control. They took it for granted that the administrators would do whatever they pleased. A government that would obey the rank and file of the people was a curious idea to them.

Mayor Indicted for Vice Bribery.

Los Angeles, Cal.—Mayor Frederick T. Woodman has been indicted on a charge of receiving a bribe for the protection of vice. George Brown and George Henderson were indicted on a charge of giving a bribe in connection with the same transaction. The indictment against mayor Woodman, stripped of its legal verbiage, charges him with "the crime of asking, receiving and agreeing to receive a bribe," a felony. The indictment recites that on or about January 1, 1919, the mayor agreed to accept from Brown and Henderson $25,000 in monthly payments of $2,500 each and that $2,000 was actually paid to a former newspaper man for the mayor, the payments being in return for alleged protection to Brown and Henderson in unlawful sales of liquor; in conducting houses of ill-repute without interference, and in conducting gambling places and games. The bond of each of the defendants—mayor Woodman, Brown and Henderson—was fixed at $10,000. Captain John D. Fredericks, attorney for Woodman, issued the following statement: "The return of the indictment against the mayor will at last furnish an opportunity to get out into the open all these charges of graft and bribery. It will put an end to these innuendoes involving the name of the mayor. At the proper time and place the mayor will appear and state the facts. He is entirely innocent of these charges." Mayor Woodman was selected for that office by a vote of the city council on September 6, 1916, to succeed C. E. Sebastian, who resigned from the mayoralty. Woodman was, prior to that time, the president of the Los Angeles Board of Harbor Commissioners. Woodman came to Los Angeles about ten years ago from Concord, N. H. In Concord he served for a time as attorney for the Boston and Maine Railroad, and was also sent to the New Hampshire Legislature for two terms, in 1900 and 1901. He is a widower and forty-seven years of age. He was reputed to be independently wealthy when he became mayor.

LEGAL NEWS

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Civil Service—Exempt Firemen—Power of Removal by Mayor.

(N.Y.Sup.) Under civil service law, section 22, protecting exempt firemen against wrong by removal from office without cause, commissioner of public safety of city of Cohoes, though removable by mayor under section 62 of charter, being an exempt fireman, can be removed only for incompetency or misconduct.—People ex rel. Kennedy v. Foley, 172 N. Y. S. 279.

Determination of mayor of city as to existence of cause for removal of an officer is subject to review by courts.—Id.

Mayor of city, in determining whether there has been misconduct of another officer, whom he is empowered to remove therefor, is both complainant and tribunal, called upon to exercise a high degree of fairness, failing in which law provides method of review for officer proceeded against.—Id.

Power of Village Trustees to Establish Fire Limits.

(N.D.) Under Comp. Laws 1913, section 3861, subd. 3, authorizing village trustees to establish measures to prevent or extinguish fires, and in view of section 3599, subd. 47, village trustees may establish fire limits.—Village of Ashley v. Ashley Lumber Co., 169 N. W. 87.

The limits of a fire district must necessarily be largely left to the sound discretion of the administrative or legislative body which is authorized to create it.—Id.

Denial of power of village trustees to establish fire limits cannot be based on fact that power is clearly granted to cities by Cities and Village Act 1895, and Laws 1887, c. 73, and that such is not true in case of villages, or under Comp. Laws 1913, section 3861, subd. 3, authorizing villages to take measures to prevent or extinguish fires.—Id.

In action in equity, the court, after resolving doubt as to validity of village ordinance, creating fire limits, imposing penalties, etc., may order removal of a wooden building erected within fire limits, though generally speaking it is not a common-law nuisance.—Id.

The contention that establishment of fire limits would be unnecessary in villages, though reasonable in cities, and that courts must credit Legislature with knowledge thereof, is without merit, in view of fact that danger from fire is greater in villages than in larger cities and that need of precautions is more necessary.—Id.

An ordinance of village trustees establishing fire limits was not arbitrary and unreasonable and discriminatory, though large part of village, including garage, etc., was not included therein.—Id.

NEWS OF THE SOCIETIES

April 9-10.—INDIANA SANITARY AND WATER SUPPLY ASSOCIATION. Twelfth annual meeting, Independent Athletic Club, Indianapolis, Ind. Asst. secretary, J. A. Craven, Board of Commissioners, Indianapolis Sanitary Dist., Indianapolis, Ind.

April 14-19.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Mineral Wells, Tex. Secretary, F. A. Rountree, Birmingham, Ala.

April 16-17.—AMERICAN WATER WORKS ASSOCIATION, IOWA SECTION. Fourth annual meeting, State University, Iowa City, Ia. Acting Secretary, J. H. Dunlap, State University.

April 25-26.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, Logan Hall, West Philadelphia, Pa.

May 6-8.—NATIONAL FIRE PROTECTION ASSOCIATION. Annual convention, Ottawa, Can. Secretary, Franklin H. Wentworth, 87 Milk St., Boston, Mass.

May 13-14—AMERICAN ASSOCIATION OF ENGINEERS. Annual meeting, Chicago, Ill. Secretary, C. E. Drayer, 29 South LaSalle St., Chicago, Ill.

May 14-15.—LEAGUE OF TEXAS MUNICIPALITIES. Seventh annual convention, Sweetwater, Tex. Secretary-treasurer, Frank M. Stewart, University of Texas, Austin, Tex.

May 19-24.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Atlantic City, N. J. Secretary, T. C. Martin, 29 W. 39th St., New York.

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

June 17-20.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, St. Paul-Minneapolis. Secretary, Charles W. Hunt, 33 W. 39th St., New York, N. Y.

June 24-27.—AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University.

June 24-27.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

American Waterworks Association.

The thirty-ninth annual convention of the American Waterworks Association is to be held in Buffalo, N. Y., June 9-13, with headquarters at the Iroquois Hotel.

The secretary, J. M. Diven, has sent out a call for information for the members of the various committees. It is requested that all questionnaires on the subject of "Private Fire Protection Services" be answered and sent in to the chairman of the committee, Nicholas S. Hill, Jr., 100 William street, New York, N. Y. The committee on "Cold Weather Troubles," Charles R. Bettes, chairman, Queens County Water Co., Far Rockaway, N. Y., wants information about frozen mains, services and hydrants, and means for preventing or remedying them, particularly thawing apparatus.

Information for the committee on "Official Standards of Water Analysis" should be sent to the secretary of the association as the chairman of the committee, Jack J. Hinman, Jr., State Board of Health, Iowa City, Ia., is with the A. E. F. in France. The committee on "Revision of Standard Specifications for Cast-Iron Pipe and Specials," of which John H. Gregory, Johns Hopkins University, Baltimore, Md., is chairman, hopes to get an after-the-war agreement on these standards and to have a universal standard.

At the coming convention the manufacturers and supply houses will make special efforts to present attractive and instructive exhibits.

International Association of Fire Engineers.

The forty-seventh annual convention date and place has been announced by secretary McFall, of the International Association of Fire Engineers. The meeting will be held in Kansas City, Mo., on June 24-27. The president of the association is Chief A. A. Rozetta, Nashville, Tenn.

Southwestern Waterworks Association

The next meeting of the Southwestern Waterworks Association will be held in Kansas City, Mo., June 23, 24, 25 and 26. R. E. McDonnell, of the consulting engineering firm of Burns & McDonnell, of Kansas City, is chairman of a local committee making preparations for this convention. An attendance of about 200 to 225 waterworks superintendents and other officials is expected.

Indiana Sanitary and Water Supply Association.

In affiliation with the Indiana State Board of Health the Indiana Sanitary and Water Supply Association will hold its twelfth annual meeting at the Independent Athletic Club, Indianapolis, on April 9 and 10.

The Wednesday morning session will be opened by the address of the president, Dr. W. F. King, assistant state health commissioner of Indiana, and the report of the secretary-treasurer, J. A. Craven, member of the board of commissioners, Indianapolis Sanitary District.

There will be a round-table discussion on "Waterworks Accounting and Financing," led by H. W. Painter, auditor of the Indianapolis Water Co. The following papers will be read: "Recent Legislation and Legal Decisions Affecting the Public Utilities," Howard A. Dill, general manager, Richmond City waterworks; "Standards of Water Supplies for Interstate Carriers," J. O. Cobb, senior surgeon, U. S. Public Health Service; "The Bacteriological Standards for Drinking Water Supplies in Interstate Commerce," Everett Judson, bacteriologist, U. S. Public Health Service.

At the luncheon Dr. J. N. Hurty, state health commissioner, will deliver an address on "Additional Lessons to Be Learned from the Recent Physical Examinations of Our Young Men."

The afternoon session will be opened by a paper on "Recent Advancement in Sanitation in Indianapolis," by B. J. T. Jeup, chief engineer, Indianapolis Water Co. The following papers will then be presented: "The Financial Side of the Private Well and Privy Vault—Can the Public Afford to Tolerate These Menaces?" by Robert E. Tracy, director, Bureau of Municipal Research, Indianapolis Chamber of Commerce; "The Relation of the Private Well to Typhoid," by H. E. Barnard, state food and drug commissioner; "The Government Plan for Control of Venereal Diseases," by Dr. King, with discussion led by Senior Surgeon Cobb; "Crenothrix Removal," by W. F. Monfort, consulting engineer, St. Louis, Mo.; "Purification of Water Supplies," by L. H. Goebel, engineer, Chicago, Ill.

At the dinner in the evening E. I. Lewis, chairman of the public service commission of Indiana, will deliver an address on "The Financial Otulook for the Public Utility," with special reference to expenditures for extensions, improvements, etc. Lieutenant-Colonel E. D. Clark, M. D., will tell the story of "Base Hospital No. 32 in the World War."

On Thursday morning there will be an automobile trip for all, which will include a visit to the new laboratories of the State Board of Health, the Government laboratory car, the Kentucky avenue plant of the Indianapolis Light & Heat Company and the Kingan & Company, Ltd., packing plant. The luncheon will be at the Riverside pumping station of the Indianapolis Water Company.

In the afternoon the following subjects will be taken up: "Proper Regulations Governing Private Fire Protection Lines" (round-table discussion), by Dow R. Gwinn, president, Terre Haute Waterworks Co.; "Equitable Rates for Water Service in Smaller Cities," by Philip Burgess, consulting engineer, Columbus, O.; "Utility Operation in Army Training Camps," by Captain H. E. Jordan, in charge of utilities, Camp Sevier, S. C.; "Some Interesting Experiences in the Operation of Camp Utilities," by John W. Toyne, captain, Q. M. C., U. S. A., in charge of utilities, Fort Oglethrope, Ga.; "Fire Inspection in Indianapolis—How Conducted—Results," by Jacob H. Hilkene, director of fire prevention, discussion being led by H. H. Friedly, state fire marshal; "Efficient Operation of the Water Department," by H. M. Ely, superintendent, Interstate Water Co., Danville, Ill., with round-table discussion on over-sizing of meters, repairing, testing, etc.

At the dinner in the evening mayor Charles W. Jewett, of Indianapolis, and governor James P. Goodrich, of Indiana, will deliver addresses. Lieutenant-Colonel Solon J. Carter, 150th Field Artillery, Rainbow Division, will recite some of his interesting experiences "Over There." Following this there will be a social session, with dancing and cards.

INDUSTRIAL NEWS

Cast-Iron Pipe and Steel.—Following the announcement of reduced pig-iron prices by the government and producers' conferences cast-iron pipe manufacturers reduced their prices by $5 a ton. It is expected that the reduction will bring out new business.

The New York Continental Jewell Filtration Co., Nutley, N. J., announces with deep sorrow the death on February 25, 1919, of Mr. Robert E. Milligan, for many years general manager of the company.

Carson Petroleum Co., 208 South La Salle street, Chicago, Ill., announces the appointment of Mr. George Fuchs as southern representative of its asphalt and road oil sales department, with headquarters at 208 Cardy street, Tampa, Fla. Mr. Fuchs was formerly connected with The Texas Company's asphalt sales department.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., in its March issue of the "Centrifugal Pump Users' Guide," offers for immediate delivery a large number of 3 phase, 60 cycle motor driven, type "S" centrifugal pumping units. They are double-suction, bronze fitted, split-casing pumps direct-connected to Allis-Chalmers squirrel cage motors with potential starters. Sizes range from 2 inch and 2 h. p. to 12 inch and 200 h. p.

Dunn Patents Sustained.

The Dunn Wire-Cut Lug Brick Company, of Conneaut, O., has been given the decision by the United States Circuit Court of Appeals of the Sixth District in its suit against Joseph Nicholson, et al., of Toronto, Ohio, for infringement of patent. The court affirmed the validity of the Dunn patent on wire-cut lug paving brick, and states that an injunction should issue against Nicholson, restraining him from making or selling the brick claimed by the complainant to be an infringement of the Dunn patent, and an accounting should be made by Nicholson to the Dunn Wire-Cut Lug Brick Company. This decision sustains every claim made by the Dunn company under the patents on paving brick taken out by Frank B. Dunn and owned by the Dunn Wire-Cut Lug Brick Company.

The case has been in the courts for two years, and the result will be of great interest to the paving brick industry throughout the country, as wire-cut lug brick are being made by 48 companies, operating 72 plants in 12 states, and they are in general use in the United States and Canada.

The suit grew out of the making and selling by Joseph Nicholson, et al., of Toronto, O., of a wire-cut brick having lugs cut with a knife instead of wires. The Dunn company sued Nicholson for infringement, claiming that the Nicholson brick was a wire-cut lug brick within the meaning of the law and the understanding of the trade.

The Circuit Court of Appeals sustained this contention. It held that the method of cutting the lugs made no difference, since whether the cutting be done by wire or knife or saw the methods are equivalent, and the Dunn company is entitled to the protection of equivalent methods. A cutting wire, says the court, acts like the cutting edge of a knife, and the cutting edge of a knife is, for this purpose, a wire; hence all such brick, whether sliced by wire or knife or saw, are in trade universally known as wire-cut brick; that Dunn's patent entitles him to the breadth of equivalency pertaining to an invention of that character.

Both the Circuit Court and the Circuit Court of Appeals concurred in the finding regarding the Dunn wire-cut lug brick that "the demand for this brick following the test of actual service was such that the output rose from 2,233,000 in 1910 to 138,000,000 in 1915."

"How It's Done."

Under the above title the **Central Foundry Co.,** 90 West street, New York, N. Y., has issued a booklet on the installation of Universal cast-iron pipe. Just how a Universal joint is made is described briefly, but adequately, and the subject is illustrated by explanatory cuts.

The Eastern Paving Brick Manufacturers' Association has elected Wm. C. Perkins, M. Am. Soc. C. E., for the past six years chief engineer of The Dunn Wire-Cut Lug Brick Company, of Conneaut, O., chief engineer and general manager of the association, comprising 35 companies with shipping territory covering Pennsylvania, West Virginia, Maryland, Delaware, New Jersey, New York and the New England states. Headquarters will be established in Philadelphia. Mr. Perkins was formerly resident engineer at Buffalo for the New York state highway commission. He went with the Dunn Wire-Cut Lug Brick Company in 1913, and during his connection with that company his duties called him to all parts of the country. His acquaintance with highway engineers is nation wide.

The Flower-Stephens Mfg. Co., Detroit, Mich., has changed its name to **The Flower Valve Mfg. Co.** The goods manufactured by this firm under the trade name "Michigan" have been well known for nearly seventy years. The original firm of James Flower and Brothers was formed in 1852, to manufacture valves and hydrants, as well as a line of ship equipment. The latter line was eventually dropped and all their energies devoted to making hydraulic supplies. Under the leadership of John W. Flower, president of the company and a son of the founder, the business has grown rapidly to its present dominant position in its field. When this country entered the war, the plant was placed at the disposal of the government and because of the officials' long experience in ship fitting, they were asked to make materials for the ships built under the direction of the Shipping Board, as well as to supply their regular product for camps and cantonments, here and abroad. Propellers, throttle valves, bilge piping, ballast piping and valves, strut bearings and stern bearings were turned out, sufficient to equip twenty-five ships per month. This work was so well done that official recognition came to them in the form of special commendation for both the high standard maintained and the quantity produced.

PERSONALS

Gregory, John H., has recently assumed his duties as professor of sanitary engineering at Johns Hopkins University. In connection with his work at the university he will also continue his private practice. Professor Gregory graduated from the Massachusetts Institute of Technology in 1895, since which time he has been engaged in engineering work connected with sewerage, water supply and refuse disposal. He has been connected with the Metropolitan Water Board of Boston, the Jersey City Water Supply Company, the Commission on Additional Water Supply for New York City and the Metropolitan Sewerage Commission of New York. For several years prior to 1917 he was associated in consulting work with Rudolph Hering, since which time he has been engaged in private practice.

Flynn, John, Jr., who was recently project and supervising engineer, United States Housing Corporation project, Watervliet, N. Y., has been appointed village engineer of Green Island, N. Y., for the ensuing year.

Welch, Major W. A., Air Service, Aircraft Production, U. S. A., division engineer of the Spruce Production Division, U. S. A., and chief engineer of the Spruce Production Corporation, has been discharged from the service and has resumed his former position as chief engineer of the Palisades Interstate Park Commission of New York and New Jersey.

Elrod, Henry E., David Drennan and Frank S. Taylor, formerly of the engineer firm of Lyndon, Taylor & Perrilliat, New York City and New Orleans, have become associated under the firm name of the Henry Exall Elrod Co., Dallas, Tex., consulting engineers, successors to Henry Exall Elrod. The new organization will continue to specialize in municipal work, utility valuation and regulation, and highway engineering.

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI NEW YORK, APRIL 12, 1919 No. 15

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Editorial Notes 259
Municipal Bonds—Water Works Prices—Returns from Refuse.

Oakland's Municipal Garage and Shop (Illustrated)..... 260
In this garage 53 cars are kept and all repairs made. Morecver several pieces of new apparatus are constructed. Great economy is claimed. The details are told by C. W. Geiger.

Refuse Disposal in London..... 263
St. Marylebone, in a war emergency, collected, screened and dumped its refuse and recovered the salable materials.

Street Lights in Columbus..... 264
Economy in gas-filled lamps and auto-transformers.

Regulating Chlorine Doses..... 264
Five-minute absorption test recommended, based on experiments by the Maryland Department of Health.

Card Index of Gate Valves..... 265

Chlorination of Sewage..... 266
Tests at New Haven on the use of chlorine for reducing bacterial content of crude sewage, screened sewage, and Imhoff and activated sludge effluents.

Newton Sewerage Notes..... 266
Some details of operating and assessing cost.

Drains in Sewer Construction (Illustrated)..... 267
Some details of the use of sub-drains in San Francisco.

Notices Painted on Sidewalk..... 267

News of the Societies..... 268

Problems Cities Are Studying with Experts..... 268

Industrial News 269

Personals 269

The Municipal Index..... 270

Contract News 13

MUNICIPAL BONDS.

Apparently this season is to be almost if not quite a record maker in the matter of municipal public work. No matter how much work is planned, ordinarily the funds for it are not raised until the carrying out of the plans is certain. Last month $52,000,000 worth of municipal bonds were issued, which is almost exactly twice as much as in March, 1918, and has been exceeded by the March output only twice during the last ten years.

The bond sales during January and February had not begun to indicate this great change in the aspect of the country concerning public work, having been considerably below normal, but the March sales have brought the total for the three months well above $97,000,000, which is about the average for the first quarter during the past ten years. There is every indication that the next two or three months will see an even larger output of municipal bonds. In fact, the amount of work to be done will apparently be limited by the ability to place contracts rather than by scarcity of funds.

WATERWORKS PRICES.

During the past two years water departments have kept their expenditures at the lowest limit possible, partly because of inability to get materials and partly because of high prices. Restrictions on materials are now removed, and prices have reached the point where it would seem that immediate steps should be taken to catch up with the maintenance and extension schedules. Iron, lead and copper go to make up by far the largest part of the machinery, pipe lines, valves, meters, etc., that constitute the largest part of the purchases made by water departments. Lead is selling at $5.25 a hundred pounds in New York, which is approximately the pre-war price. Copper is down as low as it can be expected to go. As for iron, while the price of this has by no means fallen to what it was two or three years ago, the recent reduction arranged for by the Industrial Board of the Department of Commerce has brought it to a point where it will probably be held during the balance of this year. All authorities seem to agree that there will be little if any lowering of wages during the next year. There would therefore seem to be no reason why water departments should further postpone work which is at all necessary for the proper maintenance of the plant or rendering of adequate service by it.

RETURNS FROM REFUSE.

Los Angeles cleans the streets in its business district by means of patrol sweepers, the sweepings being collected by pick-up men with a team and dump wagon, or a 2-ton motor truck with a 4-yard dump body. These

sweepings are delivered at dumping stations of local fertilizer companies, who dispose of it in the agricultural districts of the county. Last year the city received $531 a month for these sweepings.

"Green garbage" collected by the city forces is sold to the Pacific Reduction Company, at a plant within the city, for 51 cents per ton. The cost of collecting last year was $3.54 per ton for that collected by day teams, $1.91 by night teams, and $4.19 by trucks. These costs include overhead. The night shifts serve the business and close-in districts, the day shifts the residential districts. The trucks are use for outlying districts.

OAKLAND MUNICIPAL GARAGE AND SHOP

Fifty-three Cars Regularly Maintained and Others Repaired Occasionally—Maximum Economy and Efficiency Aimed At—Purchasing and Handling Materials—Records of Materials, Operations and Performances—New Equipment Constructed.

By C. W. GEIGER.

The city of Oakland, Calif., operates a municpal garage and, in connection with it, a repair shop where are maintained and repaired all of the automobiles used by the various city departments. Comparisons have been made with costs in other cities that operate municipal garages and also with those of large public service corporations and mercantile establishments, and such information as can be obtained indicates that in none of these are the cars maintained and operated at a lower cost. The economy and efficiency of the Oakland plant is being steadily increased, the fiscal year 1917-1918, when compared with the year 1915-1916, showing a saving of one-half cent per mile in the maintenance of automobiles despite the advance in labor and material.

For the latter fiscal year the average mileage of the fifty-three cars was 7,874 miles, ranging from 425 to 23,207 miles. The cost per mile averaged 5.8 cents, the maximum being 12.6 cents and the minimum 3.2 cents; less than half showing a cost in excess of 6 cents. Of these cars 29 were roadsters, 19 touring cars, 4 trucks, and 1 phaeton. The miles traveled per gallon of gasoline averaged 13.14, ranging from 19.89 to 6.23.

There are three hostlers, each receiving $100 per month, whose duties consist of seeing that the automobiles are properly supplied with gasoline and oil, and are washed when necessary, the intervals between washings averaging about three months. Each hostler is responsible for 22 cars. In case a car is wanted at the city hall in a hurry by a department head, it is delivered by one of the hostlers; but as a rule each department head calls at the garage for the car wanted, since the garage is only a short distance from the city hall.

Each machine housed in the garage is given a number, fitted with a speedometer and an exact record kept of both the machine and the tires. Between its arrival at night and when it leaves in the morning, each car is gone over by a machinist, the alignment of wheels is looked after and the whole car is seen to be in good running order. Constant attention to alignment of wheels has increased the mileage of tires and reduced the cost of tire repairs.

Gasoline for the cars is bought in open market and stored in two underground tanks with a combined capacity of 560 gallons. About 3,000 gallons is used each month. In 1918, 33,970 gallons were used by all of the automobiles, not including the police and fire department cars. When cars from these departments are repaired, however, their tanks are always filled with gasoline, and 2,513 gallons were supplied to these outside cars in this way last year.

Lubricating oil is stored in tanks, of which there are two in each garage, which are provided with self-measuring pumps. The oil is delivered in bulk or in barrels and is pumped into the storage tanks. A good grade of paraffin is used and is giving excellent results.

The hostler checks the gas and oil given each car daily, using a card system on which is entered the name and number of the car and the name of the driver. Speedometer readings are taken twice a month for the purpose of keeping record of tire mileage and gasoline and oil consumption. The record shows that the city gets an average of 9,800 miles per tire for pneumatic tires on all kinds of cars. The average cost of tire per mile is 0.32 cent.

Each driver on taking out a car of any kind from the garage must sign an "in and out" register located in the garage, giving the time of leaving and returning. The regular service hours are from 8 A. M. to 6 P. M., and if a car is out beyond these hours the reason must be filled out in the space provided for the same in the register. The aim of this is to prevent joy-riding by the city employes. These registers are collected daily and filed for reference. If a driver finds that his car needs any kind of repair, he places a check mark opposite the repair needed on a municipal garage "Repairs or Attention Needed" sheet. On this sheet is printed a list of practically all the troubles likely to occur. This slip is given to the superintendent or to the man in charge.

The "Repairs or Attention Needed" sheet contains spaces for the date, car number, name of driver, department, and a list of items to be checked off, these items being:

Motor misses fire on magneto, motor misses fire on battery, motor starts hard, motor has noticeable loss of power, motor has knock or pound, steering gear connections need repairs, foot brake needs taking up or relined, emergency brake needs attention, spark plug cracked, repair ignition wires, master vibrator sticks, carbureter leaks, horn does not blow, skid chains broken, put on new tire, pump up all tires, car taken in for repairs—date, repairs finished—date, straighten fender, presto-lite tank empty, radiator leaks, hose connections leaking, fan belt is broken, transmission needs attention, car slips in low, car slips in reverse, clutch slips in high, valves need grinding, ammeter does not register, dry cells weak, gasoline tank leaks, gasoline pipe leaks, distilled water in battery, repair windshield, overhaul motor, general overhauling, repairs made as

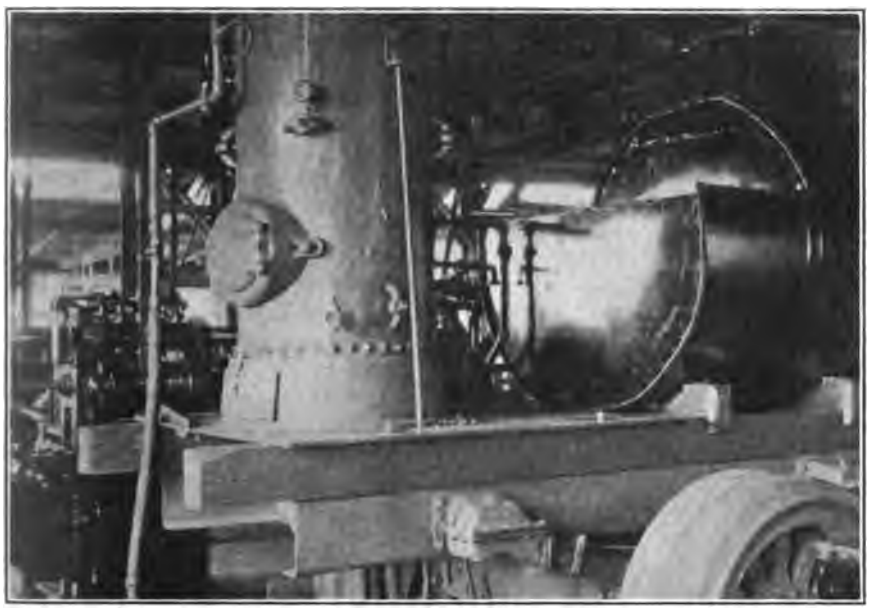
INTERIOR OF MACHINE SHOP.
Combination hose and chemical wagon under construction. In the right foreground, the nozzle outlet and 4-hose inlet.

checked, repairs made by, motor overhauled by, miscellaneous.

The "Garage Labor and Material" blank contains spaces for "Make," "Driver" and "Auto No.," a horizontal line for each day of the month, with vertical columns for "Speedometer Reading," "Hours," "Gals. Gasoline," and "Pints Oil." At the bottom are entered a list of materials used, with dates, and the signature of the hostlers.

The annual "Maintenance and Operation of Automobiles" sheet gives a line for each automobile, with vertical columns headed "Make," "Department," "Labor," "Materials," "Hostler," "Gasoline, gallons," "Gasoline, cost," "Oils," "Tires," "Tubes," "Repairs, tires and tubes," "Other supplies," "Overhead," "Total cost," "Mileage," "Cost per mile," and "Miles per gal. of gasoline." The totals for one year gave costs per mile varying from 3.2 cents to 12.6 cents; and mileage per gallon of gasoline from 19.89 for a roadster of the Street Department, to 6.23 for a truck of the Electrical Department. As a general thing, all of the poorer records were made by cars other than the standard Fords and Cadillacs, of which there were nine out of the total fifty-three.

PRISON VAN CONSTRUCTED BY MUNICIPAL SHOP.
Second-hand Cadillac chassis, lengthened and Torbeson gear drive and two-ton rear axle added. Three longitudinal seats. Will carry 22 men.



OIL SPREADER AND HEATER UNDER CONSTRUCTION.
Boiler and tank mounted on cradle, permitting quick removal and replacement with dump body.

The shops connected with the garage include a complete machine shop, blacksmith shop, wood-working shop and paint shop. There are two garages, which provide storage for sixty cars belonging to the Departments of Streets, Health, Parks, Playgrounds, Harbor, Engineering, Auditors, Electrical, Building, and Public Affairs. There are seven other automobiles owned by certain departments which are parked outside because of the necessity of frequently taking them out at night. In addition to these automobiles, the garage maintains and repairs twenty-four pieces of motorized fire apparatus, twenty cars operated by battalion chiefs, twenty-one cars operated by the police department and two patrol wagons. The police and fire departments occasionally make some small repairs on their apparatus, in shops that were equipped before the municipal garage was established, but eventually all this work will be done at the central shops.

The garage and shops are under the supervision of the Street Department and are in charge of a superintendent, under whom are employed nine machinists, three hostlers, two blacksmiths, two painters, one wood-worker and one trimmer. It is expected within a short time to house the shops in a three-story reinforced concrete building, 200 feet square, the first floor to be occupied by the garage, with a runway leading to the machine shop on the second floor, from which floor elevators will run to the top floor. At present the machine shop is housed in a corrugated iron building 62x65 feet.

MACHINE SHOP.

The equipment consists of three lathes, a 20-inch, a 16-inch, and a 12-inch; a 20-inch shaper; a 36-inch radial drill, a 20-inch drill and a speed drill; a universal milling machine; a power hacksaw, and two emery wheels. All the equipment is driven from a line shaft, the power being furnished by a 5 h. p. electric motor. There is also a Rex air compressor operated by a small electric motor, by which compressed air is maintained at 150 pounds, which air is piped through the machine shop as well as the garages and is used for filling tires and, in connection with distillate, for cleaning engine parts. There is also a portable electric drill in the machine shop capable of drilling a hole up to one-half inch, sockets for plugging-in being placed throughout the shop. The shop is lighted by both windows and skylights, and twelve 48 c. p. electric lights are provided for night work. Fire extinguishers are located throughout the building and every precaution made to guard against fire.

By utilizing the expert advice of the garage superintendent, the city has purchased a number of second-hand cars at considerable profit to itself. These cars are taken to the shop and put in the best of condition for use. Except a few that cost $1,000 each, all cost less than $500 and some as low as $200. For two cars alone the city paid $1,800 less than the cost of new cars to do the same work, and on account of the high class of the cars it is believed that ultimate saving will be even more.

APPARATUS CONSTRUCTED.

A number of different pieces of apparatus have been and are being constructed in the municipal shop, these including fire apparatus, trucks, etc. There are now under construction an oil spreader for penetration work on the streets, which will consist of a five-ton Fageol chassis which was purchased new, on which is being

mounted a tank, boiler and pump, all bolted to a heavy cradle which can be removed quickly from the chassis and replaced by a dump body. The tank has a capacity of 600 gallons; the boiler was taken from an old horse-drawn vehicle and will provide steam at 100 pounds pressure for heating the oil and also will operate a double acting piston pump for pressure delivery of the oil through the spraying nozzles. The operator will stand on a platform built on the rear of the truck.

There is also under construction a combination hose and chemical wagon to be used in connection with the high pressure system. It will carry 1,500 feet of three-inch hose and two chemical tanks. On the rear will be installed four hose inlets leading to one outlet nozzle having a universal joint, thus furnishing a stream of large volume and pressure. The truck will carry six men, three on the rear running board, two on the side running boards, and the driver. A second-hand truck that cost $325 is being used in constructing this combination wagon, the cost of which complete will probably be within $1,800. The tanks and sides were taken from an old horse-drawn chemical.

Work will soon start on motorizing a steam engine using a Christie front-drive tractor. During the past year three tractors have been constructed for horse-drawn ladder trucks, 32 h. p. Cadillac motors being used, new Torbeson two-ton rear axle and fifth wheel making these into six-wheel vehicles that are capable of traveling twenty-eight miles an hour.

During the past fifteen months three Fords have been equipped with Ralston truck attachment and specially designed four-yard dump bodies, which are employed in picking up the contents of the street sweepers' cans and hauling them to the dump. The bodies are raised with a cable hoist operated by hand. These trucks cost not over $800 each.

The machine shop has built also three trucks for the sewer repair crews, using second-hand Cadillac chasses and installing a small wagon bed in the rear of the seat capable of carrying about 1,500 pounds of material such as sewer pipe, cement, brick, shovels and other tools. Each truck carries a driver and assistant. They answer complaints and during the rainy season are used day and night in cleaning choked sewers and culverts. A truck of the same type was built for the gutter and curb repairing crew.

Two patrol wagons were built, one fifteen months ago and the other six months ago, using Cadillac chasses, 1913 models. The bodies were made at the municipal shop and all necessary changes to the chasses, the cost not exceeding $1,800 each, or less than half of the cost of similar equipment. The older of these patrol wagons has traveled 18,000 miles and has cost less than $100 for repairs. These wagons are now operating on less than six cents per mile. They are used for both police duty and ambulance calls. They carry two stretchers, also a first-aid outfit in a special compartment built in the front of the body. They have a speed of 48 miles an hour.

RECORDS AND ACCOUNTS.

A stock room is operated in connection with the machine shop. Here are carried parts for all of the makes of cars in the various city departments. It is the aim to standardize all of the municipal cars into two makes, Fords and Cadillacs, and all cars now being purchased are of these types. An advantage of this standardization is that repair parts for only two makes of cars can be carried much more economically than for a larger number of makes. Another advantage is that drivers become more familiar with the operation of the cars when there are only two makes; also the machinists become more proficient in repairing. All specials are charged off of the stock inventory as they are given out, and are also charged by the machinist on his time and material sheet, thus giving a double check for all stock used.

A machine shop time and material sheet is provided on which each machinist checks his own time daily. This sheet contains spaces for "Job" (name and number of car etc.), "Dept.," and "Week ending." The sheet is divided into one part for labor and one for material used. The former has vertical columns for the name and occupation of the employe, one for each day of the week, "Total hours," "Rates per hour" and "Amount." Under "Material Used" are columns for "Article," "Quantity," "Cost," "Total," and "Remarks." This plan requires only one card a week and makes it very simple for the superintendent to check the daily time. The sheets are kept in special racks numbered to correspond with the different cards.

Once a month the superintendent charges the hours and cost of labor and material and the garage costs on a garage invoice. The "Garage Invoice" blank provides spaces for the invoice number of the issuing department and that of the receiving department, the units, rate and total for "Hours labor," "Overhead expenses," "Pounds of babbitt," and of steel, bronze and cast iron; "Gals. of gasoline," "Pts. of oil," "Qts. of trans. oil," "Lbs. of grease." Also, under the head of "Garage," Hours of labor, overhead, tires, tubes, repairing tires, repairing tubes; under the head of "Body and Bows," items of hours of labor, and the same under the head of "Top and Curtains"; and under the head of "Painting," items of hours of labor and pints of varnish. There are also spaces for the total cost for the month, "Miles," "Main Cost," "Cost per mile," "Car No.," "Make," "Dept." and "Driver." Two copies of the invoice are made, one being sent to the department having the supervision of the car, and the other being retained by the superintendent for reference in case of dispute. The invoice is made at the end of the month and requires the spare time of the superintendent, amounting to about a day and a half. From these invoices there is prepared a yearly table which shows the total account as charged to each machine. These records are kept for the double purpose of checking the efficiency of the garage, car and driver, and also to serve as a basis for apportioning the cost in the various departments.

An efficiency report is made out monthly and posted in the main places of employment, where the men congregate, so that all can see each others' records. This is made out by the foremen of the different departments. The "Efficiency Report" is contained on a sheet, the vertical columns of which provide a column for each day, one for the names of the employes, and others for "Average Rating," "Weights," "Net Positive Mark" and "Total Positive Mark Demerits for Month Net Efficiency." Four horizontal lines are provided for each employe on which are entered for each day "Demerits," "Ability," "Quantity of Work," and "Reliability." The weights used in combining the gradings vary with each kind of employe. Each man must maintain an average of 70 to remain in the employment. This has a tendency to produce conscientious work by the individual workmen. In case of dispute in regard to any markings, the employes have the privilege of appealing to the Civil Service Commission, and in case of error the commission has the matter rectified.

All employes are under the Civil Service, and wages and other conditions are equal to those in outside plants. The men are paid a monthly salary and are not docked for sickness. Four machinists receive $160 each per

month and five receive $150 per month. Here each man has a life position as long as he remains efficient. Knowing this, the workmen take a personal interest in the plant and the work, resulting in increased efficiency. The men here are better satisfied than the majority of outside workmen; strikes and labor disputes being taken up direct with the Civil Service Commission and adjusted.

REFUSE DISPOSAL IN LONDON

How St. Marylebone Screened Its Refuse, Recovered Paper and Other Salable Materials, and Used a Clay Pit for Dumping.

St. Marylebone is a borough of London, England, with a population of about 120,000. Prior to March, 1917, the house refuse had been collected and disposed of by a contractor for a lump sum, but owing to increased costs, scarcity of labor and other difficulties, the contractor asked for a 50 per cent increase, which was granted, but when an additional 25 per cent was asked for the borough council decided instead to have the work done by the borough authorities direct, and the engineer of highways of the borough, James Gair, was placed in charge. The following account is condensed from a description of the work given by him before the Institution of Municipal and County Engineers a few weeks ago.

The council had no horses or plant available and it was decided to purchase ten 2-3 ton motor trucks fitted with special tipping bodies, and twenty horses; also to purchase and hire refuse wagons. The motor trucks were commandeered by the war department before they were delivered to the city, and refuse carts were hired and borrowed from two of the other boroughs until motor trucks were obtained some months later. Nearly all of the employes of the former contractor were taken over by the borough.

As the borough had no destructor, it was decided to dump the rubbish in a disused clay pit about two acres in area and about thirty to forty feet deep located about ten miles by canal from a wharf in Paddington basin (Paddington is an adjoining borough), which wharf was within a three-mile radius from any part of the borough. Twelve canal boats were purchased with a capacity of 40 to 45 tons of refuse and a tug operated by oil engine to transport them. At the clay pit the refuse was unloaded from the canal boats by hand labor onto dump cars and carried on a 27-inch gauge railway about two hundred yards to the dumping point. A five-ton locomotive crane with an unloading grab bucket was installed later and effected more economical and expeditious unloading.

This work was taken over in April, 1917, and in August of that year the borough purchased the leases of a group of wharfs on the northern side of Paddington basin, which had been used by the refuse contractors, who had erected there, some twenty years or more ago, a refuse screening plant. The buildings and plant were in a most dilapidated condition, not having been used for a long time, all the machinery was badly in need of repairs and it was not until the end of October that the plant could be put into anything like working order. At that time the main idea was to recover the waste paper, which was very plentiful, and the tin cans, and to obtain a residue that could be disposed of more economically than by conveying it all unsorted to the dumping point. This plant has been in operation since November, 1917.

The screening plant consists of an iron grating about 36 feet long and 9 feet wide onto which four refuse trucks can dump simultaneously. The bars of the grating are about two inches apart. All of the refuse is dumped onto this grating and the old tin cans, paper, rags, bones and all salable materials are picked off. The finer materials fall between the bars onto a conveyor, which discharges them onto an oscillating flat screen eight feet long by four feet wide, the bottom of which is formed of steel plates perforated with 7/16-inch holes. The material which passes through the screen is termed "fine ashes" and is sold to market gardeners and farmers. The material passing over the end of the screen is called "breeze" and is really a low-grade fuel and is sold as such. Experiments with washing breeze proved so satisfactory that a mechanical washer capable of dealing with forty to fifty tons a day was ordered last May but is not yet built.

In order to recover the paper mechanically, the discharge from the screen is conveyed into a wooden box at the top of which is fixed a fan driven at about 1,500 revolutions per minute, which sucks up the paper and discharges it into a basket. The author could not state whether this method would prove successful as the fan had just been put in place. The power to drive the plant is obtained by burning under a Babcock boiler the waste refuse collected from the grating.

The tin cans are put through a desoldering furnace and pressed into bales by means of a hydraulic press. The desoldering furnace cost $450. The waste paper also is baled by means of a hydraulic press. Rags are sorted and packed into sacks. Bottles are sorted and disposed of to various firms. During the year from November, 1917, to October, 1918, the borough sold the following materials: 402 tons of waste paper, bringing $17,090; 12½ tons of bones, bringing $850; 28½ tons of broken glass, bringing $375; 1,000 gross of bottles, bringing $1,705; 78 tons of rags and sacking, bringing $3,290; 334 tons of old tins and scrap iron, bringing $3,315; fine ashes and breeze, bringing $2,830. This gives a total return from all the refuse of $29,455.

The capital outlay by the borough for motors, trucks, horses, barges, tugs, steam-crane, acquisitions of wharves and screening plant was about $75,000, and the working cost for the year ending March 31, 1918, was about $100,000. It was not claimed by Mr. Gair that the arrangements were ideal, but it is to be considered that the entire working out of the plan was completed within six weeks, war conditions made the obtaining of new apparatus difficult or impossible, and it was necessary to use what could be obtained.

In view of the prospect of an early return to more normal conditions, the question arises whether these results can be maintained. In any case, however, it is the duty of every municipal engineer to consider carefully whether some system cannot be devised for recovering the waste materials that pass through his department. Whether this can be done best by compelling each householder to separate the organic and inorganic waste or by screening and sorting at one point, is a matter for investigation in each case.

Several members of the Institution of Engineers discussed the paper, one bringing out from Mr. Gair, in reply to a question, that he did not consider the plant at the wharf as the best way of handling refuse, his idea being not to have a grate at all, but to dump the refuse into a pit, from which it could be lifted by means of a grab bucket and placed on a belt or screen. He had considered replacing the present flat screen with a rotary screen, but had decided against the latter because, while

it was possible to rotate the screen, it was not possible to rotate the refuse. He had considered sorting the paper recovered, but it was so dirty when received mixed with the other refuse that he did not think it would pay to sort it.

A representative from Hampstead said that, while a few years ago destructors were regarded as the best means of disposing of house refuse and were undoubtedly sanitary, he believed that they had come to be considered as very costly. At any rate such was the case in London. Hampstead had been one of the first boroughs to erect a destructor, but last year the council completely stopped working the destructor and it was sold this year to a neighboring factory for $35,000. In the meantime he had been sending the refuse into the country. He is now preparing a plant for screening the material, passing it onto a traveling belt from which the valuable articles would be picked off, and pulverizing the remaining material. He was designing to use the smallest amount of manual labor possible.

STREET LIGHTS IN COLUMBUS.

During 1918 the municipal electric light plant of Columbus, O., replaced all the old-style carbon arc lamps on the street lighting circuits by 400 c. p. gas-filled lamps. Acting superintendent Lewis Rowe reports that the new lamps consumed only about one-half the current and required about one-half the labor for renewals and upkeep with approximately 25 per cent more light as compared to the arcs. Although the cost of current in 1918 was 3.006 cents per kw. h. as compared with 2.28 cents in 1917, the cost per street lamp decreased from $45.28 in 1917 to $27.94 in 1918. However, the saving in labor and current consumed was lost in a great measure by a great many lamps burning out whenever a swinging hot ground or an open circuit occurred while the lamps were in service. "We have lost from 50 to 70 lamps from this cause at one time when a bad case of trouble occurred, and I might add that during the months of November and December, when there was a great deal of wet and stormy weather, we lost 1,500, or one lamp out of every two on the lines. As these lamps cost $2.76 each, the cost of their replacement was $4,140, exclusive of labor.

"The loss of so many lamps was due to surges in the lines to which they were connected at the moment the break in the circuit occurred when it opened and, in the case of the swinging hot ground, at the moment of contact and break between the circuit and the ground whenever they would swing together. The remedy for this is to install on each lamp a device called an auto-transformer, which has the effect of choking back the current so that a surge of 100 per cent through the circuit will only amount to about 25 per cent or 30 per cent through the lamp. Experimenting with thirty of such coils on the lines during the last two or three years, we have found that the loss of lamps amounted to one or two per year for each installation when the coil was used. These coils paid the cost of installing them during the first year they were used, as the lamps only lasted from two to four weeks before the coils were used. The cost of these auto transformers at the present time is $3.97 each and the cost of installing them would amount to about $1.00 more, making the total cost approximately $5.00 for each unit installed.

"This department recommends that these auto-transformers be installed on every series street lamp in the city of 250 candle power and over, as they will pay for their installation in the saving of lamps alone in two years' time at the most, and also increase the effciency of the street lighting service at least 50 per cent by the decrease in the number of outages caused by lamps burning out. What the saving will be by use of the 400 c. p. lamps over the old arc lamps we cannot say at this time, due to the fact that they have been used on the old arc lamp transforming regulating sets during the year 1918 and also have been operated on the same circuits mixed in with the arc lamps during the greater part of the year; but with auto-transformers installed on each lamp to protect it from surges, they will no doubt operate at a greatly decreased cost than during the past year."

REGULATING CHLORINE DOSES

Adjusting Size of Dose to Character and Condition of Water Treated—Conclusions from Experiments by Maryland Health Department—Color and Turbidity Impracticable—Five-Minute Absorption Test Recommended.

It is probably quite generally realized by waterworks superintendents and others who use chlorine for the disinfecting of water that the application of different amounts of chlorine is necessary for the safe and economical treatment of waters of different characteristics or conditions. A few well-controlled experiments on certain waters have led to the universal adoption of chlorination of waters differing materially from those upon which earlier experimental data were made available, and the doses adopted as standard from those experiments have been found to be inapplicable to many of the waters treated.

This subject of the adjustment of the rate to the water being treated is discussed by Abel Wolman and Linn H. Enslow in a paper in the Journal of Industrial and Engineering Chemistry. The data upon which many of the conclusions are based were the result of a study to which the writers were detailed under the general direction of R. B. Morse, chief engineer of the Maryland State Department of Health.

The writers state that "In the supervision and control of a single water supply, the problem of chlorination offers far less difficulty than in the case of a group of water supplies, all of which have distinctive and disconcertingly variable qualities. The control of disinfection of a city water supply, supported by daily chemical and bacteriological examinations, may at least approach a scientific procedure, although surprisingly few cities even at this late date actually do more than a superficial dosing at a more or less constant rate."

The State Board of Health desired if possible to develop some basis on which they could advise the various cities in the state concerning the proper dosing of their several water supplies for the sterilization of them. Such advice was being asked for and "a speedy, safe, easy method of antecedent control, rather than of subsequent failure is essential." "When we bear in mind that a number of supplies are under the supervision of laymen, it becomes clear that consistently good results in disinfection are hardly attainable without the use of some presumptive indicator of an efficient chlorine dose."

The authors do not pretend to offer any established method, but merely submit the results of their tests and some conclusions therefrom, which, if demonstrated

by further investigations to be sound, may form the basis of such general method. They apparently are tentatively of the opinion that a five-minute test of the chlorine absorption of the water in question, if used with a low factor of safety, can be used in determining from time to time the chlorine dose necessary for effective treatment.

"Some experimenters assert that the amount of absoption discloses little concerning the destruction of bacteria, while others assume that the chlorine consumed in oxidizing organic matter and sometimes ferrous salts or sulphides will not effect sterilization. Since the latter assumption necessarily permits an increased factor of safety in the control of the chlorination, it is probably advantageous to use the hypothesis as a basis, until the collection of adequate data indicates what quantitative variations therefrom may be necessary."

COLOR AND TURBIDITY.

If the color of the water could be used as a presumptive indication of the amount of chlorine that such water would absorb in a given period, the convenience of this method is apparent. From experiments made by the authors, however, they concluded that even "for the same water supply, changes in color are not necessarily concomitant with variations in chlorine absorption," while for different water supplies the use of color in this way would seem to be entirely impracticable; this being because of the absence of any adequate conversion factor, even supposing that there is any relation between the two.

It is a widely entertained idea that the amount of chlorine required will vary with the turbidity of the water. The authors made a study of the Potomac river water in this connection, examining 350 samples during June and July, 1918.

"A study of the turbidity readings and the chlorine absorption tests indicates practically no correlation whatever between these two phenomena, although the turbidities ranged from 0 to 90 parts per million. The Potomac river water at the above station offers an interesting illustration of the necessity for guarding against unwarranted correlations between the physical property of a water and its biochemical conduct. In the case of the above water, the chlorine absorption values (during five minutes) showed no increase whatever with increases of turbidity, but rather a slight decrease. That the absorption remained almost constant and even decreased, in a degree, with an apparent physical degradation of the water is probably explained by the fact that the Potomac river at the point under discussion contains considerable oxidizable mine wastes. Sudden rainfalls create dilutions of these wastes, but at the same time raise the turbidity readings on the river. It comes about, therefore, that the increased muddiness in the water is in reality accompanied by a reduction in oxidizable material, without a consequent increase in chlorine absorption values. The situation is somewhat analogous to the reductions in alkalinity frequently observed with rises in turbidity. It is clear from the above situation that the direct variation of dosage with increase of turbidity would have been fallacious and contrary to the demand of the water. When the attempt is made to correlate turbidities of different waters with their corresponding chlorine absorptions, even less success is experienced. This situation is to be expected in different supplies, because of the variance in character and degree of watershed pollution."

The authors therefore conclude that the turbidity readings are not a safe index of chlorine absorption for different water supplies, but possibly may be adopted for a given individual supply if sufficient precautionary measures be taken, based upon long continued studies of widely varying phases of this supply.

OXYGEN CONSUMED.

"Inasmuch as the oxygen-consumed values of waters represent approximately the oxidizable compounds present in such supplies, it would seem that this chemical index should bear some relation to the complex action of chlorine absorption, of which some portion at least partakes of the nature of an oxidation. In order to study this phase of absorption, a series of widely varying waters, of surface and underground types and of different rates of pollution, were examined. The results indicated a fairly close variation of chlorine absorption with the oxygen-consumed values, the correlation being independent of the source or nature of the water. The amount of chlorine absorbed in a definite time interval does not increase in direct proportion with the increase in pollution of the water as measured by the oxygen-consumed test, but the 5-minute rate of chlorine absorption shows a decreasing acceleration with increases in pollution.

This relation suggests the possibility of a 5-minute chlorine-absorption test as a substitute for the much longer oxygen-consumed test as a presumptive indicator of the quality of a water. It was found by the authors to be comparatively simple to differentiate between an underground supply of good quality and a comparatively poor surface supply by means of a chlorine-absorption test made in 5 minutes.

EFFECTIVE DISINFECTION.

It is quite generally assumed that the chlorine absorption in a definite interval bears some definite relation to the disinfection effected, but there is a wide difference of opinion as to what the relation is. In practice this relation is represented by a factor of safety applied to the amount of available chlorine absorbed by the water in question in a given time, the product giving a so-called effective chlorine index.

The amount absorbed varies with the time allowed, and a dose might be considered safe only if this time interval is amply sufficient to effect the destruction of the bacteria. Intervals of 3 minutes, 10 minutes, and even 30 minutes are advocated. The authors believed that their experiments showed that the relation between the results of 5-minute and 30-minute tests were so definite that the former are as reliable as the latter, a higher factor of safety being used in connection with the shorter test. They conclude that "increased safety in dosage is occasioned by the 30-minute test in those waters where the factor of safety is least essential, whereas little additional safety is gained in waters of higher initial absorption or in those where it is most necessary." They believe, therefore, that the use of the 5-minute absorption test is to be recommended for routine control of chlorination, with a constant factor of safety, as, for instance, 0.2.

CARD INDEX OF GATE VALVES.

The Engineering Department of Newton, Mass., performs numerous services for other departments, which is paid for by them, the amount so paid for in 1918 having been $2,952.07. Of this amount, the Water Department paid $856.40, part of which was for maintenance of the water services, including a card index of water service pipes to buildings, which is kept up to date.

The city engineer reported that during 1918 work on the card index showing measurements of the gate valves

was continued, good progress being made. The gate valves are located so far as possible by measurements from house, trees, poles or other prominent objects which are always apparent when the ground is covered with snow, which in this city is likely to occur on occasion to a depth of a foot or more. The measuerments are all kept in notebooks, and subsequently a plan on tracing cloth is made to scale, if possible, traced from the 40-foot scale plans, showing the layout of mains in the vicinity of the gate and the tie measurements to the gate. These tracings are 4 inches by six inches in size, and blue prints are taken from them on heavy paper for the use of the water works employees. For indexing purposes, these plans show at the top the name of the street on which the gate is located, its direction from the nearest cross street, and the ward, date of location and note-book reference are also shown.

"The card index method of location of services and gate valves has proven satisfactory, as the cards may readily be taken from the files to be used by the workmen on the streets, and if lost or defaced are easily replaced from the original notes."

CHLORINATION OF SEWAGE

Tests at New Haven on Crude Sewage, Screened Sewage, and the Effluents from Imhoff and Activated Sludge Effluent.

In the experiments on sewage disposal conducted last year in New Haven and which have been referred to before in Municipal Journal, tests were made of the use of chlorine in reducing the bacterial content of crude sewage and plant effluents. "The effluents from the screen chamber, the Imhoff tank and the activated sludge process were conducted by wooden flumes to small baffled tanks giving detention periods of from 2 to 5 minutes, where they were chlorinated. The chlorine was applied in the form of liquid chlorine delivered from a Wallace and Tiernan solution-feed apparatus, designed for these experiments, with three solution jars and volumetric meters. The chlorinated samples were held in the sample bottles for 30 minutes before plating, to reproduce the action of the small storage tanks that would be required in an operating plant."

Twenty-seven tests were made in the application of chlorine to crude sewage, the amounts of chlorine varying from three to eight parts per million. Averaging the several tests, it was found that with three parts per million the total bacteria were reduced 87 per cent and the B. coli 55 per cent. With five parts, the total bacteria were reduced 96 per cent and the B. coli 99 per cent ; while with eight pars, the total bacteria, were reduced 99 per cent and the B. coli 94 per cent. (No explanation is offered of the lessened effectiveness of the chlorine in reducing B. coli with an increase in the dose.)

Testing screened sewage it was found that, with three parts of chlorine per million, the total bacteria were reduced 88 per cent and the B. coli 48 per cent; with five parts the reductions were 99 per cent and 97 per cent respectively; and with seven parts per million both total bacteria and B. coli were reduced 99 per cent.

In treating Imhoff effluent, the results obtained with three parts per million were 99 per cent and 65 per cent respectively, while with six parts per million the reduction was 76 per cent and 84 per cent respectively. "The unstable organic bodies which result from septic action tend to use up a considerable portion of the chlorine before it can act on the bacteria," and this probably accounts for the less effectiveness of these tests with Imhoff effluent, and possibly for the irregularity also.

"The effluent from activated sludge treatment is particularly amenable to further purification by the use of chlorine, since its original bacterial content should be already reduced and since its free oxygenated condition leaves the chlorine free to exert a maximum disinfection action. The activated sludge process, operated as we operated it, with a minimum degree of aeration, and acting on the abnormal East street sewage, yielded only a moderately purified effluent." With an addition of two parts of chlorine the total bacteria were reduced 78 per cent and the B. coli 88 per cent. In the three samples tested with three parts of chlorine, the activated sludge process had already reduced the number of B. coli 73 per cent and no further reduction was effected by the use of chlorine.

Summing up their conclusions in regard to chlorine treatment of sewage, Professor Winslow and F. W. Mohlman, the chemist of the experiment station, report as follows:

CONCLUSIONS IN REGARD TO CHLORINATION.

"It appears evident that 3 parts of chlorine will yield fairly satisfactory results with the effluent of the activated sludge process; that 7 or 8 parts are needed for crude sewage; that 5 parts will probably suffice for screened sewage; and that, so far as the Imhoff effluent is concerned, 6 parts will not give satisfactory results as to total bacteria, but may yield an effluent which is low in colon bacilli.

"In making our estimates as to the cost of chlorination combined respectively with fine screening and with Imhoff treatment, we have assumed, in the absence of more conclusive data, that 5 parts of chlorine will produce a satisfactory degree of purification in both instances, basing this assumption chiefly on the results of the colon tests which are of much more practical moment than the counts of total bacteria. It is evident, however, that this amount may very possibly have to be increased in practice, particularly in the case of the Imhoff effluent."

The cost of chlorination in each case is estimated at $4.05 per million gallons.

NEWTON SEWERAGE NOTES.

The entire sewage of the city of Newton, Mass., discharges into the outfall sewer of the Metropolitan Water and Sewerage Board, for which the city paid the board in 1918 $15,026 for maintenance of the metropolitan sewer, $9,254 for sinking fund and $40,799 for interest on its proportionate part of the cost of said sewer.

The area served by the sewerage system is seven and three-fourths square miles, and about 40,000 population is served by the 130.4 miles of house sewers. (In addition to this there are a little over 63 miles of storm sewers.) The total number of buildings connected is 7,688. In the system are four inverted siphons, 3,359 manholes and 280 direct connections with water mains for flushing. The house connections are all five-inch or six-inch and total 99.37 miles in length. They are laid by city forces at an average cost of $1.25 per lineal foot, which cost is paid by the abutting property.

Some of the sewage needs to be pumped in order to get it into the Metropolitan system, which pumping is done by means of two 2½-inch centrifugal pumps operated by two 6 h.p. gasoline engines, and one 4-inch

centrifugal pump operated by a 10 h.p. motor. During 1918 a total of 25,214,500 gallons of sewage was pumped at a total cost of $2,251.28, of which $308.83 was for gasoline, $518.15 for electricity and $1,424.30 for other expenses. The total amount of gasoline consumed was 1,235 gallons.

During the year there were 220 stoppages in the 130 miles of sewers; 129.78 miles of sewer was cleaned and repaired at a cost of $9,765.59. Flushing the system cost $2,751.56.

The cost of constructing the sewers is borne partly by the abutting property, assessment being made at the rate of 20 cents per lineal foot of frontage plus one cent per square foot of area drainable to the sewer and lying within 125 feet of the street line. Of the total cost of the system, 37.2 per cent has been assessed on the abutting property.

DRAINS IN SEWER CONSTRUCTION.

The use of drains as a method of removing ground water from trenches during the construction of sewers, which has been employed by contractors for a great many years, has been developed in San Francisco with some details a little out of the ordinary. In ground where the foundation is poor, the sewers are supported by piles, these being driven in the center of the trench for small sewers and in two rows along the sides of the trench for larger sewers. In each case a concrete bed is constructed the entire width of the trench and supported by these piles, longitudinal reinforcing bars being embedded in the concrete. Where the piles are placed in the center of the trench, the drain is placed along the side, and where there are two rows of piles along the sides, the drain is placed in the center. Broken stone is placed around and to a depth of two or three inches above the drain pipe, and the concrete foundation is placed upon this. The object of the drain pipe, is of course, to carry off the ground water that seeps into the trench in order that the concrete and other sewer construction can be carried on without interference from it.

SIDE DRAIN UNDER CONCRETE SEWER FOUNDATION WITH CENTRAL PILES.

CENTRAL DRAIN, WITH TEES FOR CLOSING.
There is a row of piles along each side, under the reinforcing rods.

In some cases it is not desirable to permit the drain to continue to operate after the construction of the sewer has been completed, and in such cases vertical T's are inserted in the drain at intervals of two hundred feet, facing vertically upward, and a corresponding opening left in the invert of the sewer when it is built around such T, the object of the opening being to fill the under drain with sand and cement after the sewer has been completed so as to prevent its continuing to carry off the ground water. Both side and center drains are shown in the accompanying illustrations.

NOTICES PAINTED ON SIDEWALK.

The mayor of Bristol, Tenn., has adopted a novel plan for calling the public's attention to ordinances relative to keeping the streets clean. He has had two stencils made which will be used for painting on the sidewalks the following notices:

"Observe the Law: Do Not Spit on the Walks."

"Observe the Law: Do Not Throw Paper or Trash on Walk or in Street."

Mayor King believes that the public do not intend wilfully to violate the city ordinances, and has adopted this plan for the purpose of calling attention to these matters. Trash receptacles have been provided in the business section of the city.

NEWS OF THE SOCIETIES

April 14-19.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Mineral Wells, Tex. Secretary, F. A. Rountree, Birmingham, Ala.

April 16-17.—AMERICAN WATER WORKS ASSOCIATION, IOWA SECTION. Fourth annual meeting, State University, Iowa City, Ia. Acting Secretary, J. H. Dunlap, State University.

April 25-26.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, Logan Hall, West Philadelphia, Pa.

May 6-8.—NATIONAL FIRE PROTECTION ASSOCIATION. Annual convention, Ottawa, Can. Secretary, Franklin H. Wentworth, 87 Milk St., Boston, Mass.

May 13-14—AMERICAN ASSOCIATION OF ENGINEERS. Annual meeting, Chicago, Ill. Secretary, C. E. Drayer, 29 South LaSalle St., Chicago, Ill.

May 14-15.—LEAGUE OF TEXAS MUNICIPALITIES. Seventh annual convention, Sweetwater, Tex. Secretary-treasurer, Frank M. Stewart, University of Texas, Austin, Tex.

May 19-24.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Atlantic City, N. J. Secretary, T. C. Martin, 29 W. 39th St., New York.

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

June 17-20.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, St. Paul-Minneapolis. Secretary, Charles W. Hunt, 33 W. 39th St., New York, N. Y.

June 23-26. — SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, Coates House, Kansas City, Mo. Secretary, E. L. Fulkerson, 617 Washington St., Waco, Tex.

June 24-27. — AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University.

June 24-27.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

American Water Works Association.

The preliminary program for the coming convention of the American Water Works Association, which is to be held June 9-13 in Buffalo, N. Y., has been issued by secretary John M. Diven.

On Monday, following registration during the day, there will be a dance and reception in the evening. The address of welcome will be delivered by city commissioner Kreinheder.

Round table discussions will occupy the morning and afternoon sessions on Tuesday. The subjects will be "The Breaking of Fire Hydrants by Motor Trucks," "Billing and Collecting," "Reading of Meters" and "Handling of Meter Readings." It is expected to have ten men prepare short papers on these subjects, to be followed by discussion limited to five minutes per member.

On Tuesday evening will be presented illustrated papers on Buffalo's water works: "Buffalo's Water Supply, with Special Reference to Filtration Problems" and "Reduction of Water Consumption by Means of Survey and Constant Inspection." There will be a theatre party for the ladies.

The business session will come on Wednesday morning, when officers will be elected and reports of officers and committees presented.

Wednesday afternoon will be devoted to an automobile trip through Buffalo, with a visit to the pumping station, and a golf tournament. There will be a smoker Wednesday evening, with a card party for the ladies.

Three or four special papers will be presented Thursday morning. In the afternoon there will be a trip to Niagara Falls, with dinner there. Friday will be left for unfinished business.

Engineers of New York.

A very interesting meeting was held recently in New York at the Engineering Societies Building which resulted in a number of strong proposals looking to the desirability of a combination or a consolidation of engineering societies, both national and local.

Members in the New York metropolitan district from eighteen societies were invited. The meeting was arranged by the local sections of the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers and the Society of Automotive Engineers. Most of the other societies participating have no special local organization.

The general subject discussed was "The Engineer as Citizen" and Gano Dunn, of J. G. White Co., presided. "The Civic Responsibility of the Engineer" was discussed by Philip N. Moore, consulting engineer, St. Louis; "The Relation of the Engineer to Legislation" by Calvert Townley, Westinghouse Electric Mfg. Co.; "The Relation of the Engineer to Administration" by Nelson P. Lewis, chief engineer of the Board of Estimate and Apportionment, New York City; "The Relation of the Engineer to Public Opinion," by Spencer Miller, Lidgerwood Mfg. Co., New York; "The Relation of the Engineer to Production and Distribution," by Prof. Comfort A. Adams, dean of Harvard Engineering School and chairman of the American Standards Committee.

Daniel L. Turner, chief engineer of the New York Public Service Commission, in discussing professional organization, urged the support of the American Association of Engineers as the unifying medium in civic activity.

Jesse M. Smith, consulting engineer, New York, described how the United Engineering Society, the holding organization for the founder engineering societies operating the Engineering Societies Building, provided the ma-

(*Continued on page 269*)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

The Dalles, Ore., will let contract to build reinforced concrete VIADUCT according to plans prepared by the consulting engineer, T. A. Garrow.

WATERWORKS IMPROVEMENTS, for which $1,000,000 bonds will be voted, are to be made by Bay City, Mich., according to plans prepared by the consulting engineers, Burns & McDonnell.

The board of commissioners of Graighead County, Jonesboro, Ark., will soon let a contract for ROAD IMPROVEMENTS involving paving with macadam and treating with bituminous surfacing 24.7 miles of road. The consulting engineers are Klyce & Kackley.

Wauseon, O., plans an election to vote on $170,000 bonds for WATERWORKS IMPROVEMENTS, including an 80,000,000-gallon capacity impounding reservoir and filtration plant. The consulting engineer is W. J. Sherman.

SEWERAGE and PAVING IMPROVEMENTS and other engineering work are to be made by the city of Ranger, Tex., to cost about $750,000. Plans are being prepared by the consulting engineers, Henry E. Elrod Co.

Saskatoon, Sask., is to make SEWERAGE IMPROVEMENTS according to plans prepared by the consulting engineering firm of Murphy & Underwood.

ROAD IMPROVEMENTS are to be made by Whitfield County, Dalton, Ga., at an estimated cost of $80,000. The consulting engineers are the firm of Johnson & Morgan.

Inglewood, Cal., will soon vote on $217,000 bonds to build a WATERWORKS SYSTEM, including wells, pumps, stand pipe, reservoir and distributing system, or purchase and improvement of the existing system. The consulting engineers are Olmsted & Gillelen.

Poinsett County, Harrisburg, Ark., has advertised for bids for ROAD IMPROVEMENTS on 16.38 miles of road according to plans prepared by the consulting engineers, W. R. Heagler & Sons.

Mt. Vernon, Ga., has advertised for bids for the construction of a reinforced concrete BRIDGE, plans for which were prepared by the consulting engineering firm of Garrett & Slack.

INDUSTRIAL NEWS

Iron and Steel Situation.—The efforts of the Federal government to encourage construction by starting with an agreed lower price on steel and iron were nullified when Director-General Hines of the Railroad Administration refused to accept the new prices. He said that the implied arrangement that the government departments begin buying at the new prices did not bind him and that he could get lower ones. The price arrangement had the backing of the Industrial Board, the various departments and cabinet members and was presumably approved by President Wilson. Attempts to arrive at some satisfactory agreement are being made. Meanwhile the prices stand as the accepted quotations of the industry.

Business as a whole does not seem very much inclined to rush into buying at the new prices.

Pig iron manufacturers from every part of America held a meeting at the William Penn Hotel, Pittsburgh, to consider the new prices for pig iron suggested by the general committee of the American Iron and Steel Institute at its meeting with the Industrial Board of the Department of Commerce.

There was some discussion on the validity of existing contracts and whether there was any understanding that the newly appointed Industrial Board of the Department of Commerce was to be regarded as having any price-fixing powers or to exercise any authority in that direction.

While the organization was in session Edward F. Goltra, St. Louis, was appointed a committee of one to discuss this point, on the telephone, if possible, with the board at Washington, with the result that W. M. Ritter, vice-chairman of the board in Washington, authorized the following statement:

The Industrial Board of the Department of Commerce has repeatedly stated that it was not a price-fixing body in any sense of that phrase and any prices recognized by it are not to be taken as 'Governmental fixed prices.' The object that the board has in mind is to urge all the Government departments to resume purchases at the prices which the board deems fair, after acquainting itself thoroughly with all the conditions and facts as to production costs in order to effect stability and stimulate trade to the end that business and industry can proceed and build up with confidence, as well as provide maximum employment of labor.

Following this statement from the board, a resolution was adopted that the approval of the board given to the prices for iron and steel suggested by the committee of the American Iron and Steel Institute does not in any manner affect or reduce the prices or obligations fixed by contracts made prior to March 20; nor are the prices announced at or as a result of the meeting with the Industrial Board to be construed as affecting contracts in existence before that date.

Wallace & Tiernan Co., Inc., New York, N. Y., has announced the return to its technical staff of Captain C. A. Jennings, who has received his discharge from the Construction Division, Utilities Branch, U. S. A. He was engaged in the supervision, operation and maintenance of water purification and sewage treatment plants in various camps. He will now resume charge of the company's Chicago office.

The Dayton-Dowd Company, Quincy, Ill., manufacturers of centrifugal and underwriters' fire pumps, announces the appointment of Mr. E. E. Maher as member of the Chicago branch, with offices at 30 N. Michigan boulevard. Mr. Maher is widely known as a sales engineer, having formerly been western manager of the Lea-Courtenay Co., and more recently district manager for the Terry Steam Turbine Co.

Material Handling Manufacturers' Association, which was reecntly organized, has appointed Zenas W. Carter secretary and manager. Mr. Carter was formerly commissioner of the Associated Metal Lath Manufacturers and before that was secretary of the Granite Paving Block Manufacturers' Association. The new association has opened offices at 35 West 39th street, New York City.

The board of governors chose the following officers: President, Calvin Tompkins, former dock commissioner of New York; vice-president, James A. Shepard, Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.; treasurer, Lucien C. Brown, Elwell-Parker Electric Co., Cleveland; acting secretary, Fred Stadelman, Wellman-Seaver-Morgan Co., New York.

NEWS OF THE SOCIETIES

(Continued from page 268)

chinery for the proposed general engineering organization, while Mr. Moore called attention to the position being attained by the engineer in the likely early establishment of a national department of public works, under which can be correlated the different engineering functions of the United States which are now scattered under twenty-two bureaus and six cabinet officers. The engineering societies of the country, he added, have been requested to send delegates to a meeting in Chicago, April 23, 24 and 25, to discuss the plan.

The resolutions adopted were summarized as follows:

That the different local memberships appoint a delegate to attend a joint conference with a view to organizing to obtain closer co-operation among engineers whereby they may become more potent in fulfilling their responsibilities as citizens.

That societies not now having committees on development be asked to appoint such committees to make a survey of the aims and purposes of their organizations and to co-operate with the existing committees.

That the representatives of the various societies participating in the meeting recommend to their organizations that a delegate be appointed to a common engineering conference to discuss, formulate and report back to their respective bodies a code for professional conduct with a view to its adoption by all of the engineering bodies involved as a common code for the engineering profession.

American Society of Civil Engineers.

The annual convention of the American Society of Civil Engineers will be held this year in St. Paul-Minneapolis June 17-20, according to a decision by the Board of Direction. The last June convention was held in Pittsburgh in 1916, the St. Paul-Minneapolis meeting scheduled for June 12-15, 1917, having been indefinitely postponed on account of war conditions.

The committee of the board in charge of arrangements consists of W. L. Darling, E. E. Wall and Charles Warren Hunt.

PERSONALS

Ash, Lewis R., has handed in his resignation as city manager of Wichita, Kans.

Montgomery, Major H. M., has been discharged from the service and has accepted the appointment of commissioner of public works and city engineer of Evanston, Ill.

Shoemaker, Geo. E., has been appointed general manager and secretary of the waterworks of Waterloo, Ia. He had been secretary for the past nine years.

Skidmore, H. W., construction engineer, department of public works, village of Oak Park, Ill., will become associated with Lester Kirschbraun, consulting and testing engineer of Chicago, and will become associate director of the Chicago Paving Laboratory, devoting practically all of his time to the paving field.

The following mayors have been elected in Iowa: Algona, W. E. McDonald; Anamosa, C. A. Beems; Atlantic, Joseph Burnea; Cedar Falls, William Morgan; Centerville, W. S. Fox, re-elected; Eagle Grove, J. T. Fort; Estherville, B. B. Anderson; Fort Dodge, A. O. Scott; Grimes, H. F. Peitman; Hampton, J. C. Powers; Iowa City, Ingalls Swisher; Jefferson, F. J. Forbes; Lemars, G. E. Ellers; Marshalltown, J. J. Wilson defeated F. G. Pierce; Mason City, N. C. Kotchell; McGregor, J. W. Boyle; Mooreland, W. E. Dickerson; Mount Pleasant, J. H. Mills; Red Oak, C. E. Owens; Newton, F. L. Maytag; Oelwein, J. F. Jepson; Oskaloosa, Al Mendenhall; Shenandoah, F. M. Hocket; Storm Lake, S. F. Lumann; Tama, T. Hixon; Vinton Philip Howe; Winterset, Wood Wilson; Weldon, J. F. Stevens; What Cheer, J. A. Cowan, re-elected.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles or any length or importance which have appeared in all the American periodicals and the leading ones published in other countries, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on muncipal matters. In furtherance of this we will furnish any of the articles listed 'n the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

ROADS AND STREETS.

Designing and Theory:

Recent Developments in Design and Construction of Pavements in Chicago. During 1918 several changes in pavement design were adopted and successfully realized in practice. By H. J. Fixmer, paving engr., Board of Local Improvement, Chicago. 2 ills., 1,600 words. Municipal and County Engineering, March. 25 cts.

Reconstruction of Narrow Roadways of Trunk Highways. Width, drainage, foundations, pavement surfaces, desirability of maintaining traffic during construction, economic improvement of line and grade. Committee report presented at the convention of the American Road Builders' Assn. 600 words. Good Roads, Mar. 22. 10 cts.

Road Foundations, Drainage and Culverts. Careful attention should be given in highway construction to foundation and drainage of roadway to provide firm and uniform support to the surfacing materials; construction and location of culverts. By George Hogarth, chief engr., Ontario Highways Dept. 6 ills., 1,500 words. Canadian Engineer, Mar. 6. 15 cts.

Wider Pavements Needed by Motor Vehicles at Curves. Theoretical width determined by formula; chart of necessary and recommended widths plotted for various radii. By G. S. Eaton, ass't division engr., Universal Portland Cement Co. 3 ills., 1100 words. Engineering News-Record, Mar. 6. 20 cts.

Highway Foundation Requirements. If the highways must carry additional loads, engineers must give more attention to their foundations. 2,200 words. Engineering World, Mar. 1. 15 cts.

Some Lessons from French Roads. Macadam roads as built in France more expensive than ours, but could not withstand our traffic; will probably fail there soon. By E. A. Kingsley, maj. of engrs., A. E. F., Nevers, France. 2,000 words. Municipal Journal, Mar. 1. 10 cts.

The Relation of Street Systems to Highways Outside of Urban District. Need of suitable connections between the primary street systems of a city and the chief highways traversing its immediate surroundings. Abstract from a paper presented at the convention of the American Road Builders' Ass'n, by Nelson P. Lewis, chief engr., Board of Estimate and Apportionment, N. Y. C. 1,400 words. Engineering and Contracting, Mar. 5. 15 cts. 2,300 words. Canadian Engineer, Mar. 20. 15 cts. 2,200 words. Good Roads, Mar. 1. 10 cts.

High Relative Temperatures of Pavement Surfaces. Thermometer readings taken on surfacings and on the adjacent lawns show a variation of from 9 to 22 degrees. By G. S. Eaton, ass't division engr., Universal Portland Cement Co., Chicago. 3 ills., 700 words. Engineering News-Record, Mar. 27. 20 cts.

The Correlation of Highway and Waterway Transport. Authority must be vested in one body with competent jurisdiction to pass authoritatively on all subjects pertaining to transport matters. Paper before the convention of the National Rivers and Harbors Congress, Washington. By Peter G. Ten Eyck, regional director, Highways Transport Committee. 1,900 words. Good Roads, Mar. 15. 10 cts.

The Relation of Highways to Railways and Waterways. Past enmity and opposition on the part of rail and water carriers to the development of highway transportation changed in the last 18 months. By Geo. H. Pride, pres., Heavy Haulage Co., N. Y. Paper before the convention of the American Road Builders' Ass'n. 800 words. Engineering and Contracting, Mar. 5. 15 cts. 1,400 words. Good Roads, Mar. 22. 10 cts.

Finances:

Suggested Methods of Financing Pavement Maintenance. The need for new legislation for adequate financing of pavement maintenance in Illinois cities pointed out by F. C. Lohman, city engr., of Champaign, in a paper at the recent meeting of the Illinois Society of Engineers. 800 words. Engineering and Contracting, Mar. 5. 15 cts.

Huge Sum to Be Spent for Highways. National government and state will expend $574,000,000 in next three years for federal aid work, while total state and local work in 1919 is estimated at $885,000,000. 1 table, 1,000 words. Good Roads, Mar. 8. 10 cts.

Bill Appropriates $209,000,000 for Federal Aid. Text of portions of the annual post office appropriation bill making provisions for large increase in government road funds and amending the federal aid road act of 1916. 1,000 words. Good Roads, Mar. 15. 10 cts.

Efficient Methods of Promoting Highway Bond Issues. Author describes the Illinois plan, which he considers efficient, equitable and thoroughly practicable for states whose conditions are similar. By S. E. Bradt, state supt. of highways of Illinois, paper before the convention of the American Road Builders' Ass'n. 1,600 words. Good Roads, Mar. 29. 10 cts.

Guarantees:

Guarantees for Paving. Opinions of several city engineers as to their desirability; duration of guarantee; for what kinds of pavement desirable. 1,800 words. Municipal Journal, Mar. 15. 10 cts.

Pavement Guarantees. Report of Committee on "Economic Status of Guarantees of Pavements on Roads and Streets," presented at the annual convention of the American Road Builders' Ass'n. 2,500 words. Canadian Engineer, Mar. 27. 15 cts.

Pavement Guarantees. Uniform length of guarantee for all pavements or for the same pavement under varying traffic conditions is neither logical nor justifiable. From a committee report submitted at the convention of the American Road Builders' Ass'n. 1,000 words. Engineering and Contracting, Mar. 5. 15 cts. 2,800 words. Municipal Journal, Mar. 8. 10 cts.

Pavement Guarantees. Editorial discussion of the report of the committee on "Economic Status of Guarantees for Pavements, on Roads and Streets," which is published in this issue. 700 words. Municipal Journal, Mar. 8. 10 cts.

The Question of Guarantees. Editorial discussion of the principle on which requiring of guarantees for pavement should be founded and desirability of requiring guarantees at all. 1,700 words. Municipal Journal, Mar. 15. 15 cts.

Contracting:

Methods of Contracting for Highway Work During the Reconstruction Period. Brief outline of methods of contracting that have heretofore prevailed; no method that will apparently offer an improvement upon lump sum bid form of contract. By John H. Gordon, pres., N. Y. State Road Builders' Ass'n, from paper at convention of the American Road Builders' Ass'n. 1,200 words. Engineering and Contracting, Mar. 5. 15 cts. 1,400 words. Municipal and County Engineering, March. 25 cts.

Competency of Contractor Deciding Factor in Awarding Highway Contracts. Must take into consideration something besides the low bid. By S. E. Fitch, division engr., N. Y. State Commission of Highways. 1,600 words. Engineering and Contracting, Mar. 5. 15 cts.

Letting Road Contracts in Long Stretches. Best interests of the public would often be served thereby. 1,200 words. Engineering News-Record, Mar. 15. 20 cts.

Cost Keeping for Highway Contractors. Suggestions for making daily estimates of unit costs; lost time; daily overhead; installing and shifting plant. Paper before the American Road Builders' Ass'n, by H. P. Gillette. Municipal Journal and Public Works, Mar. 29. 10 cts. 2,700 words. Engineering and Contracting, Mar. 5. 15 cts. 2,700 words. Canadian Engineer, Mar. 6. 15 cts.

Construction:

Road Grading with Blade Grader-Tractor Outfit. Excellent results obtained last year by Wisconsin counties by using a 10-ft. blade grader hauled by a 30 or more h.p. tractor, supplemented with small crew of wheel scrapers. 2 ills., 900 words. Engineering and Contracting, Mar. 5. 15 cts.

Ditch and Road Work Combined on Drainage Project. Spoil from dragline and wheel excavators builds roads; engineer uses tractor plows to break surface mat. 2 ills., 700 words. Engineering News-Record, Mar. 27. 20 cts.

Breaking Up Concrete Pavement with Dynamite. Method of blasting employed in tearing down an old suspension bridge in Warren, Pa. 300 words. Municipal Journal, Mar. 8. 10 cts.

Stone and Gravel Road Construction. Method of construction; selection of stone; loading at the pit. Paper before the meeting of the Ontario Good Roads Ass'n, by J. G. Wilson, county road sup't, Halton county, Ont. 1,400 words. Canadian Engineer, Mar. 20. 15 cts.

Freight Rates on Sand and Gravel. Representatives of the National Association of Sand and Gravel Producers endeavored to persuade the Railroad Administration to reduce rates. 200 words. Municipal Journal, Mar. 1. 10 cts.

Maintenance:

Methods of Maintaining Highway Systems Prior to Construction by State or County. Brief outline of what a few states are doing in the way of maintenance of unimproved, designated highway systems. By F. E. Everett, state highway commissioner of New Hampshire, paper before the convention of the American Road Builders' Ass'n. 2,200 words. Good Roads, Mar. 29. 10 cts.

Results and Lessons from First Year of State Highway Maintenance in Wisconsin. State Highway Commission began in 1918 maintaining 5,000 miles of state truck highway by patrol system, supplemented in most counties by gang maintenance. From the report of the Commission, by J. T. Donaghey, maintenance engr. 1,400 words. Engineering and Contracting, Mar. 5. 15 cts.

Road Maintenance. Repairs should be prompt, systematic and continuous; new conditions almost daily. Paper before the meeting of the Ontario Good Roads Ass'n, by F. A. Senecal, county road supt., Prescott and Russell counties, Ont., 1,500 words. Canadian Engineer, Mar. 20. 15 cts.

Repairing Pavement Openings. Practices of several hundred cities as to methods of restoring pavements; by city employes or by parties making opening; charges by cities for making repairs; minimizing number of pavement cuts. 2 ills., 3,600 words. Municipal Journal, Mar. 22. 10 cts.

Cannot Cut Pavement Within 5 Years. Signs posted in Cleveland, O., giving warning requiring all underground connections to be placed before paving is done. 1 ill., 500 words. Engineering World, Mar. 15. 15 cts. 1 ill., 300 words. Municipal and County Engineering, March, 25 cts.

No openings in Pennsylvania State Roads. Lewis S. Sadler, highway commissioner, announces that no pavement will be put down by the state highway department until every pipe or sewer connection is made on thoroughfare in question. 200 words. Municipal Journal, Mar. 22. 10 cts.

Labor:

Labor Conditions in the United States. Information and opinions collected from state highway departments, cities, contractors, and the Department of Labor; emigration of laborers. From a report by Paul D. Sargent, chief engr. of the Main State Highway Commission, to the convention of the American Road Builders' Ass'n. 1,000 words. Municipal Journal, Mar. 15. 1,900 words. Municipal Journal, Mar. 22. 10 cts.

Probable Wages and Supply of Construction Labor During Coming Season. Summaries of replies from state highway departments, cities, contractors, and information from U. S. Department of Labor. Report of committee at the convention of the American Road Builders' Assn', by Paul D. Sargeant, chairman. 2,500 words. Engineering and Contracting, Mar. 19. 15 cts. 3,000 words. Good Roads, Mar. 8. 10 cts.

Labor Available for Road Work. Brief discussion of the report at the convention of the American Road Builders' Association by Paul D. Sargent, which will be published in our next week's issue. 400 words. Municipal Journal, Mar. 1. 10 cts.

Administration:

National Highway Commission. For administration of a national highway system, is advocated by the committee of the American Road Builders' Ass'n. 2,100 words. Canadian Engineer, Mar. 13. 15 cts.

The County Highway Engineer-Manager. 31 counties in Michigan now employ county engineers on a salary; advantages of the plan. By E. E. Sours, engr., Big Rapids, Mich. 1,700 words. Municipal and County Engineering, March. 25 cts.

Operations of the Bureau of Public Roads under the Federal Aid Road Act. Underlying principle of the whole federal measure is co-operation. Paper presented at the convention of the American Road Builders' Ass'n, by P. St. J. Wilson, chief engr. and acting director, Bureau of Public Roads, U. S. Dept. of Agriculture. 2,400 words. Good Roads, Mar. 1. 10 cts.

Convention of A. R. B. A.

After-War and Motor-Truck Problems Hold Attention of Road Builders. Abstracts from the following papers presented at the meeting of the American Road Builders' Ass'n: Efficiency of Bituminous Surfaces under Motor-Truck Traffic, by Prevost Hubbard, chem. engr., U. S. Bureau of Public Roads. State, City and County Road Systems Should Be a Unit, by Nelson P. Lewis, chief engr., Board of Estimate and Apportionment, N. Y. S. Sources of Supply of Unskilled Labor for Highway Work, committee report by Chairman Paul D. Sargent, chief engr., Maine State Highway Commission. Vitrified Brick Construction for Heavy Motor-Truck Traffic, by Maj. W. M. Acheson, division engr., N. Y. State Highway Dept. 5,500 words. Engineering News-Record, Mar. 6. 20 cts. 2,200 words. Good Roads, Mar. 1. 1 ill., 3,000 words. Good Roads, Mar. 8. 10 cts.

The Tenth National Good Roads Show under the Auspices of the A. R. B. A. Brief description of the displays in the exhibition of road machinery and materials at the 16th annual convention of the American Road Builders' Ass'n. 2 ills., 2,500 words. Good Roads, Mar. 8. 10 cts.

The Convention. Editorial comment and appraisal of the sixteenth annual convention of the American Road Builders' Association, New York, February 25-28, 1919. 700 words. Good Roads, March 1. 10 cts.

Bituminous Pavements:

Efficiency of Bituminous Surfaces and Pavements Under Motor-Truck Traffic. Situation in 1918; outstanding features of road failures under heavy motor-truck traffic; bituminous surfaces as temporary method of preserving macadam road. By Prevost Hubbard, chemical engr., U. S. Bureau of Public Roads. Paper presented at the convention of the American Road Builders' Association. 2,800 words. Engineering and Contracting, March 5. 15 cts. 3,000 words. Municipal and County Engineering, March. 25 cts. 2,800 words. Canadian Engineer, March 6. 15 cts. 2,800 words. Good Roads, March 15. 10 cts.

Smooth, Dustless Roads Maintained by Gang System. Bituminous carpet placed on macadam highways in Michigan fruit district; slag has proved satisfactory for the metal of these roads. 3 ills., 2,300 words. Engineering News-Record, March 13. 20 cts.

Macadam:

Conclusions of Wisconsin Highway Commission on Surface Treatment of Macadam. From experiments conducted in the summer of 1917 by the Wisconsin Highway Commission; abstract of the report of the commission. 1,100 words. Engineering and Contracting, March 5. 15 cts.

The Reconstruction of Worn-Out Macadam Upon a State Road in Rhode Island. Surface treatment of stone-fill foundations; correcting old foundation defects; bituminous macadam wearing surface. By I. W. Patterson, chief engr., state board of public roads, Providence. 1 ill., 3,400 words. Municipal and County Engineering, March. 25 cts.

Macadam Road Built by Red Cross Refugees in China. Granite slabs of old road used for edging; type of camp built; macadam stone broken by hand. By R. R. White, Peking, China. 6 ill., 1,200 words. Engineering News-Record, March 6. 20 cts.

Method Employed in Resurfacing Old Macadam Streets in Madison, Wis. Entire surface is scarified to depth of 3 inches, then graded with street grader and rolled down with steam roller. By George Sullivan, supt. of streets, Madison. 700 words. Municipal and County Engineering, March. 25 cts.

Building New Concrete Shoulders to Preserve the Old Macadam Roads of Maryland. Procedure in construction; advantage of central mixing plant. By John N. Mackall, chief engr., Maryland State Roads Commission, Baltimore. 3 ills., 1,200 words. Municipal and County Engineering, March. 25 cts.

Brick:

Present Status of Brick Pavements Constructed with Sand Cushions, Cement Mortar Beds and Green Concrete Foundation. By Major William M. Acheson, state highway department, Syracuse, N. Y. 2,500 words. Municipal and County Engineering, March. 25 cts.

Rigid Paving Inspection Needed to Cure the "Poor Grouting" Evil. Giving views illustrating sequence of operations in recommended method of grouting a semi-monolithic brick road. By H. H. Edwards, highway engr., University of Illinois, Urbana. 8 ills., 300 words. Municipal and County Engineering, March. 25 cts.

Other Types:

Some Points to Observe in the Construction of Concrete Roads. Adequate drainage; preparation of sub-grade; coarse and fine aggregate; mixing and placing concrete. By William W. Cox, deputy state highway commissioner, Lansing, Mich. 2,000 words. Municipal and County Engineering, March. 25 cts.

Salt-Marsh Sand-Clay as a Road-Building Material. Abounds in tidal lands in Texas; primarily a mixture of Epsom salts, gypsum, clay and sand; economical to use. 1,200 words. Engineering News-Record, March 20. 20 cts.

Results of Wisconsin Experiment in Covering Sand Roads with Hay-Tar Mat. In October, 1917, the Wisconsin Highway Commission constructed an experimental highway for the purpose of determining the advantages of this method; results summarized in recently issued biennial report. 700 words. Engineering and Contracting, March 5. 15 cts.

Some Suggestions on the Proper Construction of Granite Block Pavements. Procedures in northern and southern quarries; modern adaptions of the material; use of bituminous mastic filler. By A. T. Rhodes, field engr., Paving Block Manufacturers' Association of the U. S., Boston, Mass. 7 ills., 3,500 words. Municipal and County Engineering, March. 25 cts.

State Highway Work:

Connecticut Highway Work. Report of State Highway Commissioner Bennett reviews operations of highway department in 1917-18. 900 words. Good Roads, March 1. 10 cts.

Two Types of Hard Surface Roads Successfully Employed in New Hampshire. Asphaltic concrete pavement used on two large federal aid roads; concrete roads. By F. E. Everett, state highway commissioner, Concord. 1,300 words. Municipal and County Engineering, March. 25 cts.

Some Features of Highway Work in Kansas. Benefit districts; federal aid roads and allotments; much road work coming. By M. W. Watson, acting state highway engr., Topeka, Kan. 3 ills., 1,700 words. Municipal and County Engineering, March. 25 cts.

Minnesota's Proposed Trunk Highway System. Recommendations will be submitted by commissioner of highways for building a trunk highway system approximately 6,000 miles in extent, penetrating into every part of state. 1,700 words. Engineering World, March 15. 15 cts.

Code Letters as Highway Reports. Description of letter received from Texas State Highway Engineer George A. Duren for giving in condensed space information concerning status of each highway job at date of report. 500 words. Municipal Journal and Public Works, March 29. 10 cts.

Roads in Coleman Township. Haste and erratic development; excavation provides thrills; profitable retaining walls; excellent—in wet weather. By H. T. Routly, construction engr., Ontario Highways Department. Paper before the meeting of the Association of Ontario Land Surveyors. 4 ills., 2,800 words. Canadian Engineer, March 6. 15 cts.

Road Building in 1919. What the Federal Government proposes; important suggestions as to construction and drainage. 2,000 words. The Modern City, March. 40 cts.

Miscellaneous:

Suggestions for Inspectors on County Road and Bridge Construction. Simple test of clay and silt in fine aggregate; test for organic impurities in sand; curing concrete. Useful suggestions given by C. R. Weymouth, acting division engr. of the Wisconsin Highway Commission. 1,500 words. Engineering and Contracting, March 5. 15 cts.

Design and Constructural Features of the Baraga Road in Baraga County, Mich. Road divided into four sections, and contracts awarded in April, 1918; complete length of road, 48.2 miles. By G. C. Dillman, district engr., State Highway Department, Escanaba, Mich. 2 ills., 2,400 words. Municipal and County Engineering, March. 25 cts.

Detroit Plans Comprehensive Scheme for Grade Crossing Removal. City engineers study problem as a whole, and recommend program for next fifteen years; prepare standards of design and study city planning, freight yards and industry tracks. 3 ills., 2,800 words. Engineering News-Record, March 13. 20 cts.

Canada's Road-Building Era. Joint jurisdiction in future; highways as feeders; government grants equalize cost. Informal speech delivered at meeting of the Ontario Good Roads Association by A. W. Campbell, dominion highways commissioner. 1,000 words. Canadian Engineer, March 20. 15 cts.

Paving Statistics of Cities. Concluded from last week's issue. 1,200 words. Municipal Journal, March 1. 10 cts.

Roadside Planting as a Memorial to Our Soldiers and Sailors. Many elements of importance that should be given consideration; tree planting, if properly done, of great practical value aside from that of ornamentation; affords protection by means of shade to pavement in summer. By Professor R. B. Faxon, in the American Forestry. 7 ills., 2,400 words. The Modern City, March. 40 cts.

Roads Rule the World. Active and progressive program of road building anticipated this year; roads must be classified according to traffic; basic principle of apportionment. Presidential address delivered at the meeting of the Ontario Good Roads Association by C. R. Wheelock, Orangeville, Ontario. 1,600 words. Canadian Engineer, March 20. 15 cts.

Uniform Highway Signs. Already adopted by five states; modifications of Connecticut and New Jersey signs recommended for country-wide adoption. 2 ills., 500 words. Municipal Journal and Public Works, March 29. 10 cts.

SEWERAGE AND SANITATION.

Sewage Treatment:

Sewage Disposal Works at London, Ontario. Two-story, non-reversible sedimentation tanks and enclosed filters with fixed spraying nozzles; history of London's sewerage problems since 1891; construction of interceptors and outfalls; review of work done and suggestions for further improvements. By Willis Chip-

man, of Chipman & Power, consulting engrs., Toronto. 12 ills., 4,500 words. Canadian Engineer, March 6. 15 cts.

New York Sewage Screening Plant. A few corrections in the article published in our February 18 issue on the Dyckman street plant. 100 words. Municipal Journal, March 1. 10 cts.

Sprinkling Filter Flies. Drowned by flooding filter beds for twenty-four hours; satisfactory experience with this method at Plainfield, N. J. 1,000 words. Municipal Journal, March 8. 10 cts.

Control of Sewage Filter Fly by Flooding Filter Bed. Drowning proved an effective measure to kill the myriads of small, moth-like flies in sewage sprinkling filters at Plainfield, N. J. 500 words. Engineering and Contracting, March 12. 15 cts.

Sewerage of Leominster, Mass. Treatment in tanks, with some novel features, followed by sprinkling filters; one of four units designed for city of 20,000 population; no sludge after ten months' operation. 3 ills., 1,600 words. Municipal Journal and Public Works, March 29. 10 cts.

Obtaining Sewage for Experiment Stations. Removing it from sewer by bucket elevator so as to secure characteristic suspended matter content; removing grit. 1,700 words. Municipal Journal and Public Works, March 29. 10 cts.

Sewers:

Concrete Sewer-Pipe Specifications Adopted by Los Angeles. Draft of 1919 provides for one-to-three mix; dimension variations fixed; imperfections that will cause rejections. 2 tables, 800 words. Engineering News-Record, March 13. 20 cts.

Binghamton Sand Catcher. Tried out successfully for preventing deposits in sewers with flat grade and poorly designed; adopted as standard. By W. Earl Weller, city engr. of Binghamton, N. Y. 1 ill., 800 words. Municipal Journal, March 8. 10 cts.

San Francisco Settling Chamber. Special feature is a central wall that divides the settling basin in two equal channels to facilitate removal of deposited matter. 1 ill., 200 words. Municipal Journal, March 8. 10 cts.

Sanitation:

Texas Board of Health Report. Annual report of Bureau of Sanitary Engineering of the State Board of Health records a most commendable activity along the line of sewage treatment, water purification, refuse disposal, etc. 500 words. Municipal Journal, March 22. 10 cts.

Legislation to Prevent Pollution. Of boundary waters and of waters crossing the boundary will be framed by the International Joint Commission. 1,600 words. Canadian Engineer, March 13. 15 cts.

Mosquito Control in Ponds by Means of Fishes. Results of an investigation by Samuel F. Hildebrand of the effectiveness of fishes as eradicators of the aquatic stages of the mosquito, and conduct of such operations as would promise secure "fish control" where control by oiling was impossible. Extracts from Mr. Hildebrand's report to the U. S. Commissioner of Fisheries. 1,600 words. Engineering and Contracting, March 12. 15 cts.

The Insect Problem in Cities. An excellent practice would be to employ a consulting entomologist in all large cities; requirements of municipal sanitation. By W. Dwight Pierce, Ph.D., Bureau of Entomology, U. S. Department of Agriculture. 2 ills., 1,000 words. American City, March. 35 cts.

Sanitary Service Rids Construction Camp of Influenza. Strict enforcement of ordinary sanitary precautions kept intact working force on Camp Custer extension when surrounding communities were decimated by disease. By M. D. Kauffman, division engr. in charge of sanitation, Camp Custer Extension. 7 ills., 1,800 words. Engineering News-Record, March 27. 20 cts.

Health Board Studies Pipe Corrosion in Buildings. Cast-iron vents have long life, but increasers required at roof cause rusting from stoppages; wrought iron preferable to steel. 6 ills., 1,700 words. Engineering News-Record, March 6. 20 cts.

The "Smoke Nuisance" and How It Can Be Eliminated by Civil Engineers. Air of every city can be made pure by being kept pure; street sweeping and flushing under direction of engineers, not politicians; central heating plants. 800 words. Engineering and Contracting, March 12. 15 cts.

WATER SUPPLY.

Dams:

Conditions of Stability and Suggested Design for Wooden Dam Built on Sand. Most important condition to prevent flow of water through the body of sand on which the dam rests and to protect against erosion the bed of the river immediately below. Abstracted from annual report of the Quebec Streams Commission by Arthur Surveyor, consulting engr., Montreal. 2,000 words. Engineering and Contracting, March 12. 15 cts.

Factors Requiring Special Consideration in Hydraulic Fill Dam Construction. From a paper presented before the San Francisco section of the American Society of Civil Engineers. By C. E. Grunsky. 1,600 words. Engineering and Contracting, March 12. 15 cts.

Auxiliary Outlet Gate Relieves Main Gates of Dam. Drillers on suspended platform cut opening in gate well to avoid operating main gates under high head. By R. C. E. Weber, assistant engr., U. S. Reclamation Service, Orland, Cal. 2 ills., 800 words. Engineering News-Record, March 27. 20 cts.

Recent Installations of Lang Gates. The Lang gate, a modified bear trap, has been recently in one instance as a gate for a sluice and in the other as a waste gate. Extracts from a description of these installations in a recent issue of the Michigan Technique by Donald C. May. 6 ills., 1,700 words. Engineering and Contracting, March 12. 15 cts.

Old-Fashioned Methods Reduce Cost of Dam Repairs. Contractor met local conditions and avoided expensive operations without interrupting city's water supply. By Charles F. Dingman, Association American Society Civil Engineers. 3 ills., 1,200 words. Engineering News-Record, March 13. 20 cts.

Pumping:

Pumps and Accessories. Selection of equipment requires careful consideration, as there is no one best type for all conditions; pumping by compressed air. 1,500 words. Fire and Water Engineering, March 26. 15 cts.

Stokers at Philadelphia. All of the main pumping plants equipped with mechanical stokers, handling between four and five thousand tons of coal every twenty-four hours. 1 ill., 1,000 words. Fire and Water Engineering, March 26. 15 cts.

Electric and Steam Pumping Plants. Editorial discussion of the advantages and disadvantages of electric plants for water-works pumping, with reference to the Lancaster plant, described in this issue. 500 words. Municipal Journal, March 1. 10 cts.

Electrically Operated Deep-Well Pumps. Result of tests showing performance of crank type, motor operated pump for a wide range of speeds; pump of belt driven double action type. Excerpts of paper before the Illinois section A. W. W. A. by P. S. Biegler and I. W. Fisk. 3 tables, 1,400 words. Fire and Water Engineering, March 19. 15 cts.

Lancaster's Remodeled Pumping Plant. Changed from a steam to an electric plant; cost of operating plant reduced one-third; details of pumps, motors and other equipment; result of test of pumps. By John T. Brainerd, secy. water department, Lancaster, Pa. 4 ills., 2,300 words. Municipal Journal, March 1, 1919. 10 cts.

Meters:

Water Consumption in Detroit. Maximum daily and hourly consumption; use and advantages of meters; computation of saving effected by such use. 2,200 words. Municipal Journal, March 22. 10 cts.

Meters and Accessories. The water meter a power for conservation; universal meterage not far off, and meantime more cities are adopting the system every day. 1,500 words. Fire and Water Engineering, March 26. 15 cts.

Detroit on Meterage. Superintendent George H. Fenkell presents strong argument for the system in his annual report, and backs it up with figures; great saving through use of meters; few consumers now object to them. 1,800 words. Fire and Water Engineering, March 5. 15 cts.

Meter Practices of the Hackensack Water Company. Testing meters; meter setting and reading; maintenance. By D. W. French, from a paper before the New York section of the American Waterworks Association. 1,400 words. Engineering and Contracting, March 12. 15 cts.

Compound Meters. Notes on their utility and performance; designed to obviate loss of registration on flows too small for measurement by full-line meter; improvements suggested. By Fred B. Nelson, C. E., Department of Water Supply, Gas and Electricity, New York City. 1,100 words. Fire and Water Engineering, March 5. 15 cts.

Methods of Waste Prevention. Various means employed to prevent loss in the pumping plant and the system of distribution. 1,200 words. Fire and Water Engineering, March 26. 15 cts.

Rainfall and Run-Off.

New England Rivers Have Similar Run-Off Characteristics. In seven different rivers curves show half of total flow in three months and three-quarters in six months. 1 ill., 500 words. Engineering News-Record, March 20. 20 cts.

Use of Rainfall Records. Gauges should be established relatively short distances apart throughout the country; variation in rainfall rates of different areas; mass diagrams; evaporation and run-off. Paper before the New England Waterworks Ass'n, by L. M. Hastings, city engr., Cambridge, Mass. 4 ills., 2,300 words. Municipal Journal, Mar. 15. 10 cts. Engineering and Contracting, Mar. 12. 15 cts.

Snow Surveys of Water Sheds. Methods used by state department of engineering of California. 2 ills., 1,700 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

Purification:

Rotary Screens Remove Dirt from Water at St. Paul. Drums have shells built up of screen sections; wash water received by hopper is discharged through axle. 2 ills., 500 words. Engineering News-Record, Mar. 20. 20 cts.

Some Recent Filtration Plants. Purification of surface water rapidly coming to be the established practice the world over. By Chas. W. Lusk, C.E., Pittsburgh Filter Manufacturing Co. 4 ills., 1,600 words. Fire and Water Engineering, Mar. 26. 15 cts.

Results of Application of Chloramine Process to Catskill (Esopus) Water of New York City. Relation of temperature to chloramine efficiency; treatment of turbid water with chloramine. By Frank E. Hale, director of laboratories, Dept. Water Supply, Gas and Electricity, N. Y. C. 3 ills., 4 tables, 2,000 words. Engineering and Contracting, Mar. 12. 15 cts.

The Necessity of Filtration. Why cities and towns should filter their water; economic consideration apparently most difficult of comprehension; nation's heavy typhoid list. By F. B. Leopold. 1,000 words. Fire and Water Engineering, Mar. 26. 15 cts.

Rates:

Engineer Arbitrators Fix Value of Water-Company Property. Time and money saved by engineers on ground after their representatives had made an inventory. By Farley Gannett, consulting engr., Harrisburg, Pa. 2,100 words. Engineering News-Record, Mar. 27. 20 cts.

The Unfairness of New York City in Its Relations with Water Companies. Peculiarly anomalous situation where city charter gives the municipal water commissioner the power to regulate the rates of water companies. 900 words. Engineering and Contracting, Mar. 12. 15 cts.

Daytona Sewers and Waterworks. Geo. A. Main, superintendent of water and sewerage department informs the commissioners that its low water rates have not been increased, in spite of higher cost of materials and labor. 400 words. Municipal Journal, Mar. 1. 10 cts.

Maintenance:

Construction and Maintenance. Increase in use of labor-saving machines a feature; advantage of trenching and back-filling by machinery; other devices that are gaining favor. 3 ills., 1,300 words. Fire and Water Engineering, Mar. 26. 15 cts.

Waterworks Operation: Making Water Analyses. Information concerning nearly one hundred waterworks laboratories; locating laboratory; taking samples. 1,100 words. Municipal Journal, Mar. 1. 10 cts.

Miscellaneous:

Columbus Waterworks in 1918. Effect of war prices on department's finances; less softening chemicals used; costs and results of purification. 1,500 words, Municipal Journal, Mar. 22. 10 cts.

The Hetch Hetchy Records. Letter from the city engineer of San Francisco, M. M. O'Shaughnessy correcting certain data desired by the San Francisco Bureau of Governmental Research. 300 words. Municipal Journal, Mar. 15. 10 cts.

Repairs to Risers in Tunnel Shafts. How a break in a shaft of the Catskill aqueduct in New York City was repaired; two of the bronze riser valve pipes withstand strain without rupture; steel riser pipes welded by electric arc. Excerpts from paper before the New York Section of American Waterworks Ass'n, by J. Waldo Smith, chief engr., board of water supply, N. Y. C. 2,900 words. Fire and Water Engineering, Mar. 12. 15 cts.

Cambridge Water Department. Its history traced from small beginning as a water company; originally chartered in 1837, and became a municipal department in 1865 by purchase; a 20,000,000 gallon filtration plant under consideration. 2 ills., 1,000 words. Fire and Water Engineering, Mar. 12. 15 cts.

Chicago Determines Capacity of Water Tunnel. Three tests by salt solution method check closely. By F. A. Smith, C.E., Department of Public Works, Chicago. 1 ill., 1,200 words. American City, March. 35 cts.

Water Storage. Many towns and cities planning new installations and improvements in reservoirs, standpipes, etc.; the steel tank an advantage to small waterworks. 3 ills., 800 words. Fire and Water Engineering, Mar. 26. 15 cts.

A War-Time Installation. Use of cast iron pipe for a high pressure gravity system; laid in record time despite engineering difficulties of Tennessee mountain country. By C. W. Presdee. 4 ills., 1,400 words. Fire and Water Engineering, Mar. 26. 15 cts.

Norfolk Water Department. Report of the committee on fire prevention of the National Board of Fire Underwriters; improvements in the system. 1,200 words. Fire and Water Engineering, Mar. 26. 15 cts.

How the City of Quincy, Ill., Purchased a $1,000,000 Waterworks Plant with $380,000. By W. R. Gelston, supt. of waterworks, Quincy. 2,500 words. Municipal and County Engineering, March. 25 cts.

New England Waterworks Association. Final meeting of the season; two interesting and important papers read and discussed; large number of members and guests present; new members elected. 2,000 words. Fire and Water Engineering, Mar. 19. 15 cts.

Distribution System. The vital section of the waterworks; great activity in extensions and additions to come; developments in accessories. 2,000 words. Fire and Water Engineering, Mar. 26. 15 cts.

Water Department Needs. American municipalities appropriating huge sums for extensions and improvements to waterworks, filtration and purification while hundreds of smaller towns will install systems. 1,500 words. Fire and Water Engineering, Mar. 26. 15 cts.

LIGHTING AND POWER PLANTS.

Lighting:

Street Lighting in a City of Average Size. Features of ornamental system at South Norwalk, Conn., with small initial cost and operated with a low maintenance expense; excellent illumination obtained with simple fixtures which assure safety. By C. D. Gray and E. Hagenlocher, of the J. C. White Engrg. Corporation. 6 ills., 2,000 words. Electrical World, Mar. 22. 15 cts.

All-New Water-Gas Plant Results at Providence. Portion of paper discussed by New England gas men at the recent Boston meeting with results of operation. By Wm. Russell, Providence, R. I. 4 ills., 2,100 words. Gas Age, Mar. 15. 15 cts.

Hydro-Electric Power.

A New Era in Power Transmission. Development of water power, establishment of stations at mines and wider interconnections necessary for proper industrial development of the country and for social betterment of labor. By Dr. Louis Bell. 2,000 words. Electrical World, Mar. 29. 15 cts.

State Aid for Water Power Development. Suggestion for assuring fullest utilization of power resources; government should furnish capital and control rates; complete ownership by government not essential. By A. M. Beale, Water Power Branch, Department of Interior, Ottawa. 2,600 words. Canadian Engineer, Mar. 27. 15 cts.

General Factors Affecting the Cost of Constructing Hydro Electric Development. Special investigation of water power and storage matters in Maine conducted by the Public Utilities Commission. Extracts from the report upon the cost of development of water powers and electrical energy, by H. K. Barrows, consulting engr., Boston, Mass., who was employed by the commission. 3,500 words. Engineering and Contracting, Mar. 12. 15 cts.

Electrical Generation and Distribution in Canada. Comprehensive report by commission of conservation of Canada shows hydro electric power constitutes over 85% of total; extensive interconnected networks in provinces of Ontario and Quebec. 3 ills., 4,000 words. Electrical Review, Mar. 8. 30 cts.

Colorado River Flood Control by Storage. Reservoirs at available sites would so cut the flood at Yuma as to safeguard the Imperial valley; water-power and irrigation opportunities; a hundred more gaging stations needed. By E. C. La Rue, hydraulic engr., U. S. Geological Survey, Pasadena, Cal. 7 ills., 3,600 words. Engineering News-Record, Mar. 6. 20 cts.

Steam Power.

The Power Plant. Tendency toward economy of operation; fuel and labor-saving devices in demand; boiler room should be up-to-date and efficient. 700 words. Fire and Water Engineering, Mar. 26. 15 cts.

Use of Boiler-Room Instruments. Instruments that should be employed; what these instruments show; how to interpret them. By Robert June, mechanical engr. 3 ills., 2,800 words. Electrical Review, Mar. 15. 30 cts.

Coal Consumption in Central Stations. Coal consumption of 6¼ tons per horsepower-year the minimum; load factor more important than size. 1 chart, 1,300 words. Municipal Journal, Mar. 1. 10 cts.

Power for Municipal Lighting Plants. Editorial referring to an article in this week's issue on securing the maximum efficiency and economy in coal consumption. 400 words. Municipal Journal, Mar. 1. 10 cts.

Florida Lighting and Power Stations. Preliminary figures of the forthcoming quinquennial report on the central light and power stations. 300 words. Municipal Journal, Mar. 1. 10 cts.

FIRE AND POLICE.

Fire Equipment Statistics. Apparatus now in use and in reserve in cities of the United States and Canada; remarkable amount of horse-drawn equipment still in service; figures on the progress of motorization; coming purchases of apparatus. 300 words, 7½ pages tables. Firemen's Herald, Mar. 1. 10 cts.

Chemical Engines and Tanks. Principal use found in motor combination chemical and hose trucks; also in hand-drawn chemical carts; various forms of hand extinguishers; stationary chemical fire extinguishers. 1 ill., 1,000 words. Fire and Water Engineering, Mar. 26. 15 cts.

Motor Apparatus and Equipment. Bright prospects for a brisk demand; advantages of triple combination; combination chemical and hose also popular for departments that rely on gravity or waterworks pressure. 4 ills., 3,000 words. Fire and Water Engineering, Mar. 26. 15 cts.

This Year's Needs of the Fire Service. Several millions of dollars to be spent for new equipment and improvements in the departments; general move toward completed motorization and scientific fire-fighting methods. 1,600 words. Fire and Water Engineering, Mar. 26. 15 cts.

The Arson Trust. Incendiarism and the work of the "firebug" a serious problem for fire marshals and chiefs of departments; organized arson trust uncovered by good work of fire marshal's department of Michigan. By Homer Rutledge, ass's state fire marshal of Mich. 1 ill., 1,200 words. Fire and Water Engineering, Mar. 19. 15 cts.

Loss Information Service. Important part insurance companies play in furnishing information to the fire marshal as to incendiaries; harm that timidity in showing up fraud can do in prosecution of the firebug. By State Fire Marshal L. T. Hussey, of Kansas. 1,000 words. Fire and Water Engineering, Mar. 12. 15 cts.

Lessons of a Film Fire. Pittsburgh explosion and fire in film exchange which caused heavy loss of life; the national board of fire underwriters draws conclusions and emphasizes lessons taught; new law suggested to regulate storage. 4 ills., 2,000 words. Fire and Water Engineering, Mar. 5. 15 cts.

Alarm Systems and Accessories. History shows progress toward certainty of operating and increasing development to meet modern requirements; the siren fire alarm popular; compressed air systems. 1,000 words. Fire and Water Engineering, Mar. 26. 15 cts.

The Advantage of Police Patrol Signal Systems to Municipalities. Contribute to increase the efficiency of police departments not less than 40 per cent. 1 ill., 1,200 words. American City, March. 35 cts.

TRAFFIC AND TRANSPORTATION.

Street Railways:

Railway Right-of-Way Surveys and Descriptions. Location chainage must be checked; description of curve; a line as a right-of-way. By E. T. Wilkie, formerly chief engr. Toronto Suburban Railway. 2,500 words. Canadian Engineer, Mar. 6. 15 cts.

Six Hundred Safety Cars in 60 Cities. New England Street Railway Club is told how use of safety car is still spreading rapidly; safety cars are revenue producers, expense cutters and good will gainers. 3,700 words. Electric Railway Journal, Mar. 8. 15 cts.

How Can the Public Be Convinced? Replies to questionnaire sent out by this journal that the public men express conviction that the public will respond to a frank and honest presentation of facts if good service is provided and the companies ask for a return on only a fair valuation. 5,500 words. Electric Railway Journal, Mar. 1. 15 cts.

Ethical Aspects of the Situation. Causes of fare trouble analyzed and remedies suggested; belief that the fallacy of a fixed fare has won widespread recognition and railways are "at the dawn of a better day." By R. T. Sullivan, gen. mgr. Mahoning & Shenango Railway & Light Co., Youngstown, O. 7,000 words. Electric Railway Journal, Mar. 1. 15 cts.

Fifty-Fifty for Car Rider and Taxpayer. Massachusetts commission recommends such plan to meet deficit of Bay State system from five-cent fare. 2,300 words. Electric Railway Journal, Mar. 1. 15 cts.

The Zone Fare in Practice—Glasgow. Extent of system; character of service and riding; fares. 7 ills., 6,500 words. By Walter Jackson. Electric Railway Journal, Mar. 8. 15 cts.

Miscellaneous:

What the Government Did in Inland Waterway Navigation. Director-General of railroads reports on progress made during 1918 on waterways taken over by his administration. 1,800 words. Engineering News-Record, Mar. 6. 20 cts.

Truck Transportation of Laborers and Materials. Results and costs on work done by federal health authorities at Macon, Ga. By W. E. Hardenburg. 800 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

STREET CLEANING AND REFUSE DISPOSAL.

Street Cleaning:

Recommended Procedure in Cleaning Streets in Rochester, N. Y. Brief constructive criticism of the common methods of street cleaning with special reference to conditions in Rochester. From summary of report submitted to mayor, by James W. Routh, chief engr. and John T. Child, ass't engr., Bureau of Municipal Research. 1,900 words. Municipal and County Engineering, March. 25 cts.

Methods of Removing Snow from Highways. How to prevent snow from drifting; portable and stationery snow fence; snow removed by road grader; A-shaped snow-plow; hand methods. 2,300 words. Engineering and Contracting, Mar. 5. 15 cts.

Methods of Snow Removal from Highways. Efficient methods outlined by state highway commissioner of Connecticut, Chas. J. Bennett in a report at the convention of the American Road Builders' Ass'n. 1,400 words. Engineering and Contracting, Mar. 5. 15 cts.

A Study of Street Flushing. Result of investigation of Rochester methods by Bureau of Municipal Research; machine flushing and hose flushing by contract and by city; recommendations concerning procedure; sprinkling methods. From report by John T. Child, under supervision of James W. Routh, ass't and chief engineers of the Bureau. 7 ills., 4,400 words. Municipal Journal, Mar. 8. 10 cts.

Anaheim's Sprinkler Truck. Equipment consists of a 2-ton Ford truck and can be used as truck with sprinkler an ordinary sprinkler wagon attached; can be used as truck with sprinkler detached. 1 ill., 400 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

Refuse Disposal:

Wrapping Garbage. Practice still continued in Minneapolis and Trenton, two of the larger cities that adopted it some years ago. 400 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

A Garbage Crematory with Self-Respect. That of Spokane, Wash., finished in white to compel cleanliness, and parking development of grounds carried out; showers and rest room for employes; systematic plans for storing materials. By Arthur E. Peterson, supt. of crematory division, department of public works, Spokane. 1 ill., 1,500 words. Municipal Journal, Mar. 15. 10 cts.

Are Our Cities Clean? Editorial comment on the filthy and unhealthy condition of the dumps, garbage disposal plants and other places where refuse is deposited in many of our cities. 700 words. Municipal Journal, Mar. 15. 10 cts.

Municipal Waste Disposal by Cremation. England shows greatest development in crematories; comparison of incinerators and destructors show that latter have many advantages over former. By James Elmo Smith, University of Illinois. 3,500 words. The Modern City, March. 40 cts.

Indianapolis Garbage-Reduction Profits. Nearly $15,000 net profits reported from operation of the garbage-reduction works from May 26 to Dec. 31, 1918. 500 words. Engineering News-Record, Mar. 27. 20 cts.

Creek Banks for Incinerator Refuse. A letter from J. F. Byxbee, Jr., city engr. of Palo Alto, Cal., describing the use of incinerator refuse by that city. 500 words. Municipal Journal, Mar. 15.

Garbage Disposal Costs and Contracts. Editorial discussion of the relative costs to cities of different methods of disposal and length of contract period. 1,300 words. Municipal Journal, Mar. 22. 10 cts.

Report on Methods of Garbage and Rubbish Collection and Disposal. Results of recent investigation by a Pittsburgh municipal committee—Part 2. 1 ill., 1,200 words. American City, March. 35 cts.

Transporting a City's Garbage. Reduction plant in Cincinnati employs most up-to-date form of railway transportation for carrying waste from wagons to plant. By Felix J. Koch, 3 ills., 500 words. American City, March. 35 cts.

Baltimore Adopts Feeding for Disposal of Garbage. Former disposal methods; specifications covering reduction method; temporary disposal by burial; contract provisions. By W. E. Lee, water engr., Baltimore. 2,500 words. Municipal and County Engineering, March. 25 cts. 2,000 words. Engineering and Contracting, Mar. 12. 15 cts. 1 ill., 1,700 words. Municipal Journal, Mar. 22. 10 cts.

MATERIALS AND STRUCTURES.

Materials:

Effect of Quantity of Mixing Water and Curing Conditions on the Strength and Weight of Concrete. Result of experimental studies by Prof. Duff A. Abrams of the Lewis Institute, Chicago. 9 ills., 3,600 words. Engineering and Contracting, Mar. 26. 15 cts.

Blast Furnace Slag in Concrete and Reinforced Concrete. Oxidation of sulphides in slags; practical suggestions for production of reinforced concrete. (Continued form Feb. 15.) By Dr. J. E. Stead, F.R.S. 3,200 words. Engineering World, Mar. 15. 15 cts.

The Age of Concrete. Uses to which this indispensable material is applied; making of cement revived and utilized only during the past half century to any extent. 5 ills., 2,300 words. The Modern City, March. 40 cts.

Bridges:

Artistic Bridge and Highway Railings. American culture calls for more attractive structures; illustrations of attractive railings. 9 ills., 1,500 words. American City, March. 35 cts.

Bridge Substructure Construction with Concrete Caissons Sunk by Open Excavation Method. Design and construction of concrete caissons; methods of sinking caissons. 3 ills., 3,000 words. Engineering and Contracting, Mar. 26. 15 cts.

Maintenance and Painting of Highway Bridges. Every structure should be inspected at least once a year; estimating amount of paint required. By Chas. D. Snead, bridge engr., state department of public roads, Kentucky. 2,000 words. Engineering and Contracting, Mar. 26. 15 cts.

Move Bridge Spans 136 Feet Endwise on Car Trucks. Two lines of steel trucks on falsework carry hydraulic jacks which raise three spans together and support them while hauled by cables. 4 ills., 2,000 words. Engineering News-Record, Mar. 13. 20 cts.

Reinforced Concrete Slab Bridge Design Based on Tests of Full Size Slabs. Effective widths under central loads and values for effective widths. By A. T. Goldbeck, engr. of tests, U. S. Bureau of Public Roads. 2 ills., 3 tables, 1,500 words. Canadian Engineer, Mar. 6. 15 cts.

Arch Analysis by a Method Using Variable Elastic Weights. By simplifying the computation of the summations required, new tabular form permits rapid solution of arch problem by influence lines. By F. J. Delude, with J. C. White Engrg. Corporation, N. Y. 3 ills., 2 tables, 1,200 words. Engineering News-Record, Mar. 6. 20 cts.

Canadian Reinforced Concrete Arch Bridges. Historical review and lists of open spandrel and earth-filled arches with clear span of over 100 ft. or total bridge length of over 200 ft.; brief review of concrete truss bridges. By Frank Barber, consulting engr., Toronto. 6 ills., 3,300 words. Canadian Engineer, Mar. 13. 15 cts.

MISCELLANEOUS.

Efficient Methods of Financing Highway Bond Issues. Problem has many factors determined by local conditions; license fees work well in states lacking good roads. 1,300 words. Engineering News-Record, Mar. 20. 20 cts.

Municipal Revenue and Real Estate Taxes. Giving letter from the director of the Bureau of Industrial Research of Indianapolis, Ray S. Trent, referring to the article on "Increasing Municipal Revenue" which appeared in our issue for Feb. 15. 500 words. Municipal Journal, Mar. 8. 10 cts.

Pennsylvania Has Emergency Public Works Commission. Body provided for two years ago to tide over expected periods of depression is now stimulating construction. 1,000 words. Engineering News-Record, Mar. 13. 20 cts.

Grand Haven's Municipal Utilities. Financial statement of Grand Haven, Mich., sent by city manager, I. R. Ellison, warrants the pride he takes in them. 300 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

New Engine Terminal Outside City Avoids Congestion. Crowded site replaced in open country; water stored and treated; standard designs employed; engines coaled on three tracks. 6 ills., 1,700 words. Engineering News-Record, Mar. 13. 20 cts.

Inclined Viaduct for Pedestrians. Brief description and illustration of viaduct built to avoid climbing steps up bank. 1 ill., 100 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

San Francisco's Protected Beach. Description of esplanade which has proved to be a satisfactory method of protecting beach. 8 ills., 1,200 words. Engineering World, Mar. 1. 15 cts.

Municipal Markets a Check to High Prices. Bill passed by the New Jersey Legislature in 1917 with a view to protect public from the extortion of food profiteers; farmers' markets popular in several New Jersey cities; the municipal market at Long Beach, Cal. 3 ills., 2,400 words. The Modern City, March. 40 cts.

Cost of Camp Utility Operation by the Construction Division of Our Army. Roads, buildings, fire protection, electric service, heating, water-supply, sewerage and sewage treatment with grease recovery, refrigeration and railroad service. By Geo. W. Fuller, consulting engr., N. Y. C. 1 ill., 3,100 words. Engineering News-Record, Mar. 27. 20 cts.

Central Station Heating: Its Economic Features with Reference to Community Service. Extracts from an interesting discussion of possible economies that may be effected through the wider use of central heating, by John C. White in Technical Paper 191, issued by the U. S. Dept. of Interior. 3,200 words. Engineering and Contracting, Mar. 12. 15 cts.

Some Conditions Observed in Public Utility Plants by a Representative of the U. S. Fuel Administration. Means of reducing expenses; interconnection of power and utility plants; steam pumping sometimes most economical. By Chas. Brossman, consulting engr., Merchants Bank bldg., Indianapolis, Ind. 2 ills., 1,700 words. Municipal and County Engineering, March. 25 cts.

Waste Paper Reports. Annual report of a water board containing 70 pages, two pages of which would suffice to print all the information concerning year's operation that it is desirable to include. 400 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

Accurate and Compact Record of City Property. New Castle, Pa., has system of maps and forms covering entire city to record property titles and transfers. 1 ill., 1,000 words. Engineering News-Record, Mar. 20. 20 cts.

Centralized Buying for Municipalities. Resolution adopted by the National Association of Purchasing Agents at recent meeting. 200 words. Municipal Journal, Mar. 22. 10 cts.

Day Labor Does Municipal Work at Flint, Mich. Engineer favors direct employment for cities of moderate size and contract system for small and large cities. 600 words. Engineering News-Record, Mar. 13. 20 cts.

The Construction Prospect. U. S. Department of Labor reports projected work totaling in value about $1,709,000,000. 150 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

Will Prices Fall? Editorial discussion of the national question of the day; not likely to fall in the near future; business men should adjust themselves to a permanently higher price level in order to save the nation from misfortune resulting from unemployment. 1,400 words. Engineering News-Record, Mar. 20. 20 cts.

Governors' and Mayors' Reconstruction Conference Fails to Get Action. Officials at meeting in Washington do more listening than talking and adopt prepared resolutions, but recommend no comprehensive program. 2,000 words. Engineering News-Record, Mar. 13. 20 cts.

Practicing Engineers Suggest Lines of Progress in Engineering Education. Communications from practicing engineers indicating directions in which engineering colleges should progress. Articles by John D. Isaacs, consulting engr., Southern Pacific Co., N. Y.; A. P. Davis, director, U. S. Reclamation Service, Washington, D. C.; Virgil G. Marani, War Service Committee on Gypsum, Washington, D. C.; M. M. O'Shaughnessy, city engr., San Francisco; John S. Crandell, N. Y. C.; F. L. Bishop, dean, School of Engrg., University of Pittsburgh; J. A. L. Waddell, consulting engr., Kansas City, Mo. 4,800 words. Engineering News-Record, Mar. 6. 20 cts.

How the Cornell Society of Civil Engineers Find the Right Job for the Right Man. Description of system developed by registration bureau of the society, abstracted from article by C. S. Rindfuss. 1,000 words. Engineering and Contracting, Mar. 19. 15 cts.

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI NEW YORK, APRIL 19, 1919 No. 16

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Editorial Notes 275
Regulating Truck Weights and Sizes—But How About the Bridges?—Hundreds of Millions for Roads.

Are Our Highway Bridges Safe? (Illustrated) 276
At least one hundred thousand and possibly three times that number of highway bridges are unsafe for the heavy trucks now allowed by law on our highways. This article gives figures to substantiate this startling statement.

Highway Bridges and Heavy Trucks 279
Report of a committee of the American Road Builders' Association, telling the need of stronger bridges and how the present ones can be strengthened.

Highway Work Contemplated for 1919 281
Nearly four hundred million dollars is already appropriated for road work in 1919, and more than one hundred million will be within a few weeks. The sums itemized by states are given in this article.

Construction of Highways in Cuts (Illustrated) 282

Snow Fences (Illustrated) 282

Tabulated Highway Data:
Facts and figures furnished by county highway officials especially for this issue.
Bridge Failures 283
County Work Contemplated for 1919 284
Results of Heavy Traffic 287
Pavement Guarantees 289
Contract Work 291

National Roads 293
An appeal for national highways, based upon the success of such roads in France, by a Major of Engineers with the A. E. F., **E. A. Kingsley.**

Development of Brick Pavements 294
Discussion of the latest practices relative to foundations, sand cushions, monolithic and semi-monolithic construction. By **Wm. M. Acheson.**

Financing Highway Improvements 29
Presentation of some fundamental principles, by a committee of the American Road Builders' Association, of which the chairman is **Nelson P. Lewis.**

Hay-Tar Roads in Wisconsin (Illustrated) 297
The Week's News 298
News of the Societies 301
Industrial News 302
Personals 302
Contract News 31

REGULATING TRUCK WEIGHTS AND SIZES.

Last week the Pennsylvania state administration and the Motor Federation agreed on a bill that is expected to become a law at this session of the legislature. Fees are based on horse power. Motor vehicles (except fire apparatus) can not be more than 28 feet long or 90 inches wide, and the weight can not exceed 26,000 pounds except by special permit. Commercial vehicles weighing more than 3,000 pounds must contain the chassis, body and load weight painted on their sides in three-inch figures. Fifteen miles is the maximum speed for trucks up to 5,000 pounds; twelve miles for 8,000-pound vehicles; ten miles for 10,000-pound machines, and eight miles for all heavier trucks. Thirty miles is the maximum for other cars, except where local laws set a lower limit.

It will be remembered that the American Road Builders' Association last month adopted a resolution favoring 28,000 pounds as the limit of weight and 28 feet and 96 inches as the limit of size. It is unfortunate that a uniform standard cannot be adopted by all states, considering the great and increasing amount of interstate trucking that is taking place.

BUT HOW ABOUT THE BRIDGES?

What will happen when a 13-ton truck crosses a 6-ton bridge? While trucks of the former weight are to be permitted by the Pennsylvania law above referred to, the state highway department engineers have found numerous bridges on the important highways of the state that are not safe for more than six tons, and a considerable number that can not with safety be asked to carry more than three tons.

This inconsistency is by no means confined to Pennsylvania. We doubt whether there is a single state where conditions are much if any better. Many of them have passed laws limiting the weights of trucks to maximums that not a quarter of the bridges in the state can carry with safety. Some startling figures on this subject will be found elsewhere in this issue.

HUNDREDS OF MILLIONS FOR ROADS.

The most enthusiastic good roads advocate could hardly ask for more wholesale improvement of our highways than is in prospect for this year. In the majority of states the amount of such work done will be limited almost entirely by the amount that can be done and not by the money needed to pay for it. Four hundred million dollars has already been appropriated, and another hundred million, and possibly two hundred, will be available

by July; while other hundreds of millions are being arranged for to permit continuing the work next year. We refer now as casually to millions as we did to thousands a few years ago in speaking of road work.

What part of these millions each of the several states has available for this year's work is detailed in this issue. Only one state admits less than a million, and at least one or two count on more than twenty millions.

ARE OUR HIGHWAY BRIDGES SAFE?

County Highway Officials Say One-Third of All Bridges Are Unsafe for Heavy Trucks—A State Authority Says Eighty Per Cent.—Defective Bridges More Serious Than Defective Roadways.

Thirty per cent of the bridges on the county highways of the country are considered by the officials in charge of them to be unsafe for the heavier vehicles that are now using those highways.

This is not a random statement or mere guess work. On another page in this issue will be found figures from county engineers or other county officials presenting their opinions as to the number of bridges in their respective counties that are unsafe for the traffic using their highways. These returns cover 33 states of the Union and the total number of bridges reported is about 75,000; and of those 75,000, about 22,500 are considered unsafe.

It will be noted that these figures are not those of alarmists or faddists, but are given by hundreds of county officials who are themselves in charge of the highways and bridges in question, and who would, it would seem, be more apt to underrate than to overrate the danger which these bridges present to the traveling public. The figures were given in reply to the question: "How many of your bridges do you consider unsafe for the heaviest traffic on your roads?" Six county officials said that none of their bridges were safe for such loads, while only 21 per cent claimed that all of their bridges were safe. Twenty per cent stated that 50 per cent or more of their bridges were unsafe, and 8 per cent admitted this concerning 75 per cent or more of their bridges.

A chain is as strong as its weakest link; and a highway system cannot safely carry vehicles any heavier than those that can use its weakest bridges.

Millions are being appropriated and spent for improved highways; and while, in a number of states, bridges are specifically mentioned as the subject for appropriations, in the majority of cases it is merely understood or implied that a part of the appropriation may be used for bridges, and in too many states bridges receive almost no benefit from the state or county appropriations.

Six, eight, ten and even fifteen-ton trucks are permitted on the highways of many states, and the roadway surfaces are being adapted to such loads; while on those same roads can be found bridges containing the sign "Not safe for loads of more than three tons," or possibly five tons, or in some cases less than three tons. When a ten-ton truck, finding roads suitable to carry it, reaches a bridges with such a sign, what is its driver expected to do? And what *does* he do? In some cases at least, rather than retrace his steps, he takes a chance. Results of such taking of chances are shown by illustrations on these pages. In some cases lives are lost, but in probably the majority the loss fortunately is confined to the truck, traction engine, road-roller or other heavy vehicle, and to the bridge floor or sometimes the entire bridge. Incidentally, the public which would otherwise continue to use this road suffers a loss, in that the bridge is impassable for weeks and possibly months, during which time either a considerable section of road is out of service except for purely local traffic, or teams must cross through the stream by detour.

WOODEN TRUSS BUCKLED.

In reply to a question submitted a few days ago to the State Highway Department of Pennsylvania, we received the information that "All bridges on the state's primary system for which the state is responsible are to be rebuilt. Department engineers, in their studies of interstate, canal and county bridges, have discovered numerous bridges the condition of which has been such that it has been necessary to post them, warning the public that they are not travelable with loads varying from three to six tons. Many important thoroughfares cross some of these structures."

STEEL TRUSS BUCKLED.

DEFECTIVE ROADWAY VS. DEFECTIVE BRIDGE.

When holes or other bad spots appear in a highway surface, they may be responsible for an occasional broken spring at the worst, while ordinarily they merely require a slowing up of traffic or possibly a short detour onto the shoulder. Occasionally insufficient width or a chuck-hole which requires a detour onto a soft earth shoulder results in a hold-up of a heavy truck until aid can be secured to draw it back onto the paved way. These are the results of insufficient width or strength or character of roadway pavement.

The result of insufficient width or strength of a highway bridge is much more serious, both to the vehicle which ultimately causes its partial or total destruction, and also to all traffic on the highway which is held up for days or weeks until repairs or a renewal of the bridge can be completed. The figure of speech

of the "weakest link" applies perfectly. The bridge is an essential part of the highway and the highway as a whole is not safe for any load that the bridge will not support in safety. With that link—the bridge—out of commission, the entire chain is useless except as its two short sections can be used independently.

WHICH IS WORSE FOR THE TRUCK AND WHICH FOR THE HIGHWAY?

A truck carrying acetylene tanks for government ship yards mired on a soft shoulder.

A thousand-gallon oil truck through the floor of an old county bridge.

Lack of strength is not the only dangerous element in a bridge. The wing-walls or other forms of protection to the abutments may be so inadequate that a freshet may undermine or destroy them; and no matter how strong the bridge, it can support no more than the abutments themselves will carry, and can of course support nothing with the abutments removed. That this is a real danger is indicated by some of the accompanying photographs showing that concrete bridges, steel bridges and masonry arches have all been known to fail because of the washing out of abutments. To prevent such an accident, it may be necessary to extend the investigation and the construction for a considerable distance above and below the bridge itself in order to provide against the erosive effects of freshets. In order to avoid the expense attendant upon the construction of a long bridge, the abutments in many cases are placed too close together, contracting the waterway; or in order to avoid too long or too steep approaches to the bridge, the bridge is placed too low and freshets, carrying logs, trees and other heavy and bulky articles, may sweep the bridge from its abutment.

It is evident that to be safe, a bridge must not only have sufficient strength in itself, but it must be of such length and so provided with abutments and approaches for the stream as to prevent its destruction by outside causes.

PRECAUTIONS THAT SHOULD BE TAKEN.

As to the bridge itself, the hundreds of accidents that have occurred indicate that the floor is usually the weakest point. In the majority of cases the vehicle that causes the damage breaks through the floor, leaving the trusses or girders comparatively uninjured. In hundreds of cases which probably are not entered on the records at all, the floor boards break at some knot or worn out or rotted point and the damage is limited to this. But it undoubtedly happens that in some cases, at least, the breaking of a floor board brings a jolt and strain upon the floor beams and other members of the floor system which causes them to give away, although they would have carried the load had not the floor boards broken. The moral of this seems to be that continuous attention should be paid to bridge floors, and the first sign of weakness should be remedied by replacing a worn or rotting plank or planks. The floor beams and other members are ordinarily more difficult to get at than the truss members, but require even more careful and frequent inspection and painting.

No argument would seem to be necessary to prove that, when a maximum limit of load is set for the highways of a state or county, any bridges on such highways that were designed for lighter loads should be replaced with heavier ones. Until they can be so replaced, warning notices stating the maximum safe loads that they can carry should be posted not only on the bridges themselves but also on the roads leading to the bridges; and penalties should be enforced upon such as disregard the notices.

Equally important is the periodic inspection of bridges by competent men and the immediate remedying of all defects found. All steel and iron work should be kept painted to prevent rust; and in doing this, the hidden floor beams and other parts of the floor system should not be overlooked. Before painting, all loose paint and scale should be thoroughly removed.

In the case of wooden bridges, the first indication of rotting at joints or bolt holes should lead to an immediate replacing of the decaying member; and decay at other points is only slightly less dangerous.

A rust hole or rot hole the size of a dime is as serious a matter in a bridge as a chuck-hole the size of a wagon is in a roadway. It requires more careful inspection to determine the former, and the necessity of such inspection should be continually emphasized in instructions to foremen and others in charge of highway maintenance.

One of the remarkable things about the situation is the considerable number of county officials who not

only keep no complete and up-to-date record of each bridge upon their county road systems, but do not even know exactly (some admit that they do not know even approximately) the number of bridges on the county roads under their supervision. Of highway features as important as bridges, there should be a record of every one; the plan of giving each bridge a number, which is adopted by some highway departments, being an excellent one. The record of each bridge should give the date when built and details as to its length, features of design, etc., and the live load for which it was calculated. There should be entered upon the record of each bridge the dates when it was inspected and the general tenor of each report as to whether the bridge was in good condition and for how heavy loads it may be considered safe; and the dates when the bridge was painted should be entered also. There should also be some systematic method for insuring that every bridge is inspected periodically, while special ticklers may be used for insuring a more frequent and thorough inspection of bridges concerning whose safety there is some question.

"LOOK ON THIS PICTURE, THEN ON THAT."

Both of these bridges are in the same state. One is an invitation to disaster; the other will probably carry any load that the roadway will carry for the next twenty-five years.

When a highway official knows that half or three-fourths or all of the bridges on the highways in his county are unsafe for some of the traffic using such highways, it would seem to need no argument to convince him that the matter is one of the most vital importance and should be presented as such before the taxpayers or whatever source must be looked to for obtaining the funds necessary for replacing such bridges.

We believe that the highway departments and others having control of state and county highways would be justified in making and strictly enforcing a regulation under which no road of which a bridge comprises a part would have a dollar of state or county funds spent upon the improving of it until such bridge had been rendered safe in all respects for carrying the heaviest load that would use such improved highway within at least the next five years, so far as the development of highway traffic can be foreseen. New bridges should be built for the loads of twenty years hence.

This subject was reported upon at the recent convention of the American Road Builders' Association by a committee of that association and its report is given elsewhere in this issue. The ever-increasing weight of motor trucks is causing the rapid wearing out of many of our older highways, but an even more serious result is that it threatens to rapidly bring about the complete destruction of a large percentage of our older bridges.

STEEL BRIDGE ABUTMENT WASHED OUT.

CONCRETE BRIDGE ABUTMENT WASHED OUT.

If one-third of the hundreds of thousands of bridges in the country are already unsafe for present-day traffic, it certainly is time that the most strenuous efforts were made to replace these; since such replacing, if begun at once, must take several years, and every year will see increasing scores of these bridges falling down under the heavier and ever heavier loads that are being run over them.

Bridge renewal is lagging far behind roadway renewal. It must catch up quickly, even if we have to hold back roadway work to permit it to do so.

HIGHWAY BRIDGES AND HEAVY TRUCKS.

Necessity of Frequent Inspection by Competent Men —How Weak Bridges Can Be Strengthened.

The following report to the American Road Builders' Association by its committee on Methods of Strengthening and Reconstructing Highway Bridges for Heavy Motor Truck Traffic, of which the chairman is Willis Whited, bridge engineer of the Pennsylvania State Highway Department, is a progress report and general in its nature. The need for giving vastly more attention to the subject is discussed and demonstrated by figures elsewhere in this issue.

The auto truck is with us to stay. The number will surely greatly increase and the weight also will show a constant tending to increase as better methods of constructing pavements and better materials and designs for tires, etc., are introduced. It is not necessary to enlarge upon the various uses to which they may be put. Their usefulness in many lines is well established and in others is yet to be developed. A joint committee of this association and of the National Highway Traffic Association is considering the question of the weights, etc., to be allowed on public roads, and until their report is adopted it may not be advisable to lay down definite standards for determining the necessary strength of old bridges; but it may be well to call attention to the following facts: A well-designed, well-constructed, well-maintained reinforced concrete bridge will, so far as we can see, last for centuries. Trucks rated now as heavy may appear puny in 1975. Steel bridges well designed, built and maintained will last at least 50 years and probably much longer. The engineer is, therefore, using good economy in looking well into the future in designing new bridges, especially as a bridge designed to carry a 20-ton truck would not generally cost very much more than one designed to carry a ten-ton truck; whereas if it were designed now to carry a ten-ton truck, and if it were found ten years hence that it must be replaced with one capable of carrying 20 tons, the cost of making the change would be several times greater. If an old bridge is to be strengthened, it is only a temporary makeshift at best, and the engineer is not justified in looking many years ahead in deciding on the assumed loading.

WASH-OUT AT ARCH CULVERT.

In the course of an investigation by a committee of the New York Legislature it developed that there were in that state about 33,800 public highway bridges more than 5 ft. in span, which would indicate that there are about 400,000 such bridges in the United States. It is safe to say that the failure of any one of a very large proportion of them would be liable to cause loss of life. It is also probable that more than 80 per cent are unable to carry a modern heavy truck with a reasonable margin of safety. It will thus be seen what a colossal task it would be to replace all of them with modern structures, and also to what an extent the bridge engineer is the custodian of human life. We will not hazard a guess as to the total cost of such replacement, but it would probably amount to several billions of dollars.

Every one of these bridges should be inspected at least once a year by a competent man. A majority consist of a single span of wooden stringers, with plank floors. In the case of such bridges the main points to be observed are the safety of the abutments and the sufficiency of the width, the safety of the railing, the adequacy of the waterway and the strength and soundness of the stringers and planking. All these points require sound judgment and reasonable amount of engineering knowledge. With the larger bridges the responsibility is greater, and the danger of loss of life in case of failure is also greater. Many bridges require inspection oftener than once a year. All steel bridges should be painted every 3 or 4 years by competent men who are carefully instructed to report all defects observed. Many parts of steel bridges are not accessible for proper inspection without the use of scaffolding such as painters use. It is not always practicable to employ such scaffolding during the annual inspection.

In preparation for the advent of heavy trucks, all public bridges should be examined by competent men who will make a record of the character of the traffic likely to come upon the bridge, the dimensions and conditions of all vital members and the sufficiency of the details, and written reports of such inspections forwarded to the proper state department for record. From these reports it must be decided which bridges require complete reconstruction, which require new superstructures, and which can be repaired and strengthened. The necessary plans can then be prepared and should be checked on the ground. These inspections should be paid for by the public, preferably on a salary or per diam basis. It should as a rule be done by men who are not financially interested in the construction of bridges by contract.

The strengthening of bridges often requires far more engineering skill and ability than the design and construction of new ones.

As to how this work of strengthening should be carried out, much depends on circumstances. Estimates of cost are sometimes misleading. Unit costs of repair or alteration work in place are often more than twice the unit costs of similar material in new work. When an engineer starts to repair an old bridge he is almost certain to find a considerable amount of work that must be done that he had not anticipated. For these reasons it usually is best to have the material furnished or fabricated by contract in the field, the work being done by days' work if a reasonably efficient gang can be organized. Expensive equipment, such as pile-drivers, air-compressors,

etc., may be rented on a per diam basis. If it is a well-defined job, such as replacing a floor system or an abutment, it can be done satisfactorily by contract; otherwise a bidder is confronted by the same difficulty as the engineer in estimating his cost, and will either bid high to cover risk and uncertainty, or will bid reasonable prices, expecting to make up with his bill of extras, which will be no small item. Often, however, a "cost plus" contract is prefered, but it must be so worded that it is either to the contractor's interest to furnish proper tools and equipment or he can be forced to do so. It is not always practicable to insure that the work can be done within the appropriation. Another difficulty often encountered in a repair job handled by a lump-sum contract may be illustrated as follows: The engineer estimates $10,000 as an outside figure for the job, he secures an appropriation of $15,000 to cover extras, the bidders have no way to estimate accurately their cost and are apt to be guided by the amount of the appropriation and bid about $14,900, leaving far too small a margin for extras. If an efficient gang cannot be organized, the "cost plus a fixed sum" system is generally the best, except that on public work public opinion must always be considered, and many people have an idea that the "cost plus a fixed sum contract" is only good for war-work and similar work in which the maximum speed is absolutely necessary regardless of cost.

The committee does not consider that in deciding whether any given member of a bridge needs strengthening it is necessary to hold strictly to the letter of the standard specifications in the matter of unit stresses. In fact, a deficiency of 20 per cent. in material is not serious provided the details are good and the material is in good condition, it being felt that the usual unit stresses adopted make that much allowance for deterioration, besides secondary stresses, etc. Less allowance, however, should be made in the case of floor-beam hangers, stringers and floor beams which are subject to widely and rapidly varying stresses. In considering the strength of a bridge truss, it is not necessary to assume that the bridge is packed full of trucks of maximum weight; but, if the bridge is 16 ft. wide or over, it is always possible that two heavy trucks may pass on the bridge.

The committee feels that in cases where the strengthening of a bridge will make it in effect a permanent structure, the bridge should be designed to carry a truck weighing at least 20 tons, the idea being that the committee having this matter under consideration is concerned primarily with the roadway pavement, as to which the loading specifications can be economically revised within the next ten or fifteen years on account of the wearing out of the pavements, whereas a bridge is a much more permanent structure.

The committee fully recognizes that the immediate strengthening of all the bridges in the country that need it, together with the reconstruction of those which cannot be economically strengthened, is a physical, as well as financial impossibility. It would, therefore, recommend that immediate steps be taken to have a thorough examination made of all important structures by competent engineers and their safe loads determined and indicated by proper signs, to the end that the public be protected so far as is humanly possible. Any person who disregards these notices and suffers disaster has only himself to blame. The work of preparing plans for strengthening should then proceed without delay so that construction will be delayed as little as possible.

The small bridges will generally have to be rebuilt, the steel truss bridges will generally be found fairly strong in the trusses, but altogether too weak in the floor system. These will require strengthening or reconstruction. If the stringers only are somewhat weak their number can be increased at quite a moderate expense. Few of the steel truss bridges are strong enough to carry paved floors, although many can be refloored with 2-inch by 4-inch creosoted wood set on edge and spiked closely together. This will give a much more durable floor and one much less liable to break through under heavy loads. The weight is but little greater than that of a plank floor. Plate girders can often be strengthened by riveting on additional cover plates. Riveted lattice trusses can often be reinforced to carry paved floors without throwing away any existing material.

Pin-connected trusses can rarely be strengthened, and occasions will frequently arise where it is necessary to support the floor by means of timber bents consisting of piles if the bottom is soft, or by means of mud-sills and posts if the bottom is hard. If these are used they should be placed under all the floor beams, the outer posts being about two feet inside the centre lines of the trusses. This method, of course, is not suitable if the stream is likely to carry much drift wood or floating ice.

Timber truss bridges can often be strengthened. If, as is frequently the case, the floor only is weak it is generally possible to put in heavier timber in the floor or to strengthen it with steel to carry heavy trucks.

If a truss is weak it seldom increases its strength to place bents under the floor beams unless all the floor beams are supported in the same way, taking the load almost entirely off the trusses.

Stone arches are almost always amply strong to carry the load if they are in good repair, but it is sometimes necessary to remove the earth covering and grout the joints between the stones to give them a full bearing. Stone arches, moreover, will usually show signs of distress long before total failure. It is rarely possible to strengthen a plain or reinforced concrete arch. Plain concrete arches are more liable to fail suddenly without warning than almost any other kind of a bridge.

It is, of course, understood that all plans for strengthening bridges should be made and carried out under the direction of a competent engineer. Many bridges are not safe to carry auto truck traffic on account of being so narrow as to be dangerous to vehicle traffic at high speed, but it is much better for a truck to reduce speed at a bridge than to break through it. Pending the strengthening of any existing bridge it should be examined by a competent engineer, and the heaviest load which it can safely carry should be indicated by proper sign boards.

The question of detouring traffic while a bridge is under repair is often quite difficult. It is frequently possible to support the old bridge with bents and maintain traffic over the bridge during repairs, although this method adds considerably to the cost of repairs. Sometimes a timber trestle can be built alongside or in the vicinity.

The list of bridges which have failed under heavy trucks, with or without loss of life, is a long one. In the vast majority of cases it is only the planking or the stringers which have broken through.

It is the duty of officials in charge of public highways to maintain them in such condition that they are safe and convenient for all reasonable and lawful traffic which may come upon them, and the limit of loading on bridges of a state should be fixed by statute in order to determine what are reasonable and lawful loads. It being understood always that any private parties desiring to transport heavier loads on them than is provided for

by statute can do so by paying the extra cost of making the bridges of the desired strength.

HIGHWAY WORK CONTEMPLATED FOR 1919

Nearly Four Hundred Million Dollars Already Available, and More Than One Hundred Million Assured for Road Work This Year.

Never before in the history of the world has a nation set aside so large a sum for road construction as is available for that purpose in the United States in the year 1919. In fact, it is a question whether all the nations combined have ever spent so much in a single year. Between half and three-quarters of a billion dollars has been voted, appropriated or otherwise dedicated to road work by the federal government, the states and the counties.

It is not at all probable that all of this will be used this year—in fact, not all of it is available this year. The amount that is already available, as shown in the statement below, totals about $375,000,000. An additional $95,000,000 of federal aid funds will be available before the end of the season (so far as it may be duplicated by state funds), and a good many millions will probably be arranged for by state legislatures, most of which, however, will not be available before next year.

How much of this 375 million dollars will be spent this year will depend, apparently, upon how many reliable contractors can be found, how much labor, material, and road-building machinery, and also upon costs, to a certain extent. The amount and wages of labor in about two hundred counties scattered over the entire country are given elsewhere in this issue. Wages are of course higher than before the war, but in most parts of the country there seems to be plenty of labor.

The cost of road building materials will depend largely upon freight rates. Concerning this the Bureau of Mines reported recently:

A strong feeling exists among all bodies directly concerned in highway work that present freight rates are relatively high in view of the low price that road materials command. In many instances the freight charged is one to two times as much as the cost of the crushed stone, sand or gravel at the quarry or pit. According to a letter from the Railroad Administration to the Highway Industries Association, dated March 5, 1919, no reduction in rates is contemplated except for federal, state or municipal work, and some doubt is expressed regarding a reduction even for materials for such work.

Under date of April 2nd, the Department of Agriculture said that "the present freight rates are one of the principal obstacles to the active resumption and extension of highway activities," but that "it is hoped that a favorable decision will be made in the near future" by the Railroad Administration.

AMOUNTS ALREADY AVAILABLE BY STATES.

From information obtained from state highway officials, the Bureau of Roads, and other reliable sources, we have prepared the following statement of the funds already available for expenditure by each of the states:

Alabama: Federal Aid Funds—$1,676,167. No definite state appropriation or plans.

Arizona: Federal Aid Funds—$1,096,125. Funds available from state—from taxes, $834,000; motor license fees, $160,000; prison labor funds, $70,000.

Arkansas: Federal Aid Funds—$1,338,315. Amount available for road building from counties, sub-divisions of counties, the state, and federal aid, $50,000,000. The program includes 7,000 miles of roads.

California: Federal Aid Funds—$2,433,607. About $20,000,000 available.

Colorado: Federal Aid Funds—$1,375,920. To be expended under supervision of state highway department—$700,000 from half-mill tax; $150,000 from interest on internal improvement fund, from $160,000 to $200,000 from automobile registration, and about $2,600,000 from county tax levies.

Connecticut: Federal Aid Funds—$492,552. State Highway Department will spend about $4,000,000, according to Commissioner Bennett.

Delaware: Federal Aid Funds—$130,350. State will probably spend $2,000,000 and counties $1,000,000, including about $1,000,000 of contracts from last year.

Florida: Federal Aid Funds—$912,450. Commissioner Wm. F. Cocke expects to spend about $6,000,000.

Georgia: Federal Aid Funds—$2,152,943. Counties will do $3,000,000 to $4,000,000 of work with convicts, and bonds for $3,000,000 are contemplated.

Idaho: Federal Aid Funds—$974,371. State road construction funds available, $1,100,000; county co-operative funds estimated at about $1,500,000. (Reported by State Highway Engineer H. C. Allen, April 9.)

Illinois: Federal Aid Funds—$3,506,653. Bond issue for $60,000,000 voted in 1917, legality affirmed by Circuit Court in March, 1919; decision from Supreme Court expected in June. Supt. of Highways S. E. Bradt expects to use $2,000,000 for state aid roads, $6,625,000 for federal aid roads, and $10,000,000 will be spent by townships. It is proposed to do as much work as they can find engineers and contractors for.

Indiana: Federal Aid Funds—$2,163,392. Expects to spend about $2,500,000 in addition to federal aid.

Iowa: Federal Aid Funds—$2,316,227. Hopes to complete the federal aid projects on which they were unable to obtain bids last year. Little additional work contemplated. About $15,000,000, including county and township funds.

Kansas: Federal Aid Funds—$2,295,068. State will raise approximately $875,000 from automobile licenses, all of which must be used for road dragging. By district payment and federal aid it is hoped to lay about 250 miles of brick and concrete roads this year.

Kentucky: Federal Aid Funds—$1,562,266. About $1,500,000 available.

Louisiana: Federal Aid Funds—$1,086,908. Estimated by state highway engineer that $4,674,000 will be spent this year.

Maine: Federal Aid Funds—$771,393. Appropriations made are $375,000 for state highway work, $500,000 for state aid work, and $500,000 for maintenance of state and state aid highways. Also there will be about $500,000 from cities and towns for state aid work, $200,000 for maintenance, and $500,000 for bridges.

Maryland: Federal Aid Funds—$697,750; $3,000,000 state funds will be spent to a large extent this year; also about $800,000 state aid funds.

Massachusetts: Federal Aid Funds—$1,179,697. Probably will be about $4,000,000 available, and possibly more appropriated for special projects.

Michigan: Federal Aid Funds—$2,319,921. About $19,000,000. available from township, county and state taxes, including automobile tax. Petitions made for more than 1,000 miles of district assessment roads; $50,000 bond issue to be voted on in April.

Minnesota: Federal Aid Funds—$2,273,822. Program calls for an expenditure of $7,750,000. Bill for $100,000,000 bond issue has been introduced in legislature.

Mississippi: Federal Aid Funds—$1,434,957. About $3,000,000 is available, about half held over from last year.

Missouri: Federal Aid Funds—$2,713,079. Projects costing $4,000,000 approved and will probably be built this year.

Montana: Federal Aid Funds—$1,592,850. In addition to federal aid, probably $400,000 state aid and $3,500,000 county funds will be spent.

Nebraska: Federal Aid Funds—$1,706,400. Projects prepared for 1919 call for $1,660,000, nearly one-half of which will be federal aid, and $340,000 for county and state aid bridges.

Nevada: Federal Aid Funds—$1,029,358. The state plans to spend $1,300,000.

New Hampshire: Federal Aid Funds—$333,410. Expects to spend about $1,500,000, including federal aid.

New Jersey: Federal Aid Funds—$948,046. The state highway department plans to build 50 miles of road at a cost of $2,000,000. Convicts will be used. The counties and smaller units will probably spend $6,000,000 more.

New Mexico: Federal Aid Funds—$1,273,634. The state highway department has available from state and county tax levies, vehicle and gasoline taxes and licenses, and county bonds, $1,930,000; special levies for Farmington-Albuquerque road, $60,000. County road levies, vehicle licenses and others will add $800,000; giving a total of $4,063,000.

New York: Federal Aid Funds—$3,989,791. A bill passed in March appropriates $5,500,000 for maintenance and repair of state and county highways. About $6,000,000 of construction now under contract will be completed by the state. Probably about $8,500,000 of state aid work will be done; also a considerable amount of county work. The total expenditure will be between $18,000,000 and $23,000,000.

North Carolina: Federal Aid Funds—$1,825,680. All county work, probably about $5,000,000.

North Dakota: Federal Aid Funds—$1,226,375. About $600,000 to be spent by the state and about $2,000,000 by counties and townships.

Ohio: Federal Aid Funds—$2,973,222.

Oklahoma: Federal Aid Funds—$1,844,962. Counties will spend $5,000,000 or more, part from last year's unused appropriations.

Oregon: Federal Aid Funds—$1,259,854. The state has awarded contracts amounting to about $750,000. About $6,000,000 is available.

Pennsylvania: Federal Aid Funds—$3,678,154. A $50,000,000 bond issue was voted last November, and more than $14,000,000 has already been made available, of which $5,000,000 is for permanent state highway construction, $3,000,000 for state aid, $1,200,000 for maintenance and repair of state highways, $500,000 for turnpike condemnation, $1,142,000 for second-class township bonuses.

Rhode Island: Federal Aid Funds—$186,500. About $600,000 will be available for state highway and bridge work.

South Carolina: Federal Aid Funds—$1,147,734. Bond issue cannot be voted until 1920. Plans are under way for constructing 1,060 miles of hard surface and 500 miles of sand-clay roads.

South Dakota: Federal Aid Funds—$1,296,734. About $1,800,000 is left over from 1918 county levies, and the counties will raise about $3,400,000 this year. The state expects to spend about $783,000, including federal aid. A $20,000,000 bond issue is being advocated.

Tennessee: Federal Aid Funds—$1,815,227.

Texas: Federal Aid Funds—$4,678,989. About $20,000,000 worth of work has been definitely decided on, and $5,000,000 is already under construction.

Utah: Federal Aid Funds—$909,205. It is expected that about $3,000,000 will be spent in this state.

Vermont: Federal Aid Funds—$362,650. Funds available—state appropriation, $260,000; 5% state highway tax, $125,000; voted by towns, $100,000; federal aid as above, and an equal amount of state funds; total, $1,210,300. Also $645,000 for maintenance. All of above will be spent that can be wisely.

Virginia: Federal Aid Funds—$1,589,156. There is already under contract or being prepared for letting $3,106,000 worth of roads, not including county expenditures, and in addition to federal aid, but the last probably will not be available. The governor is in favor of a $25,000,000 bond issue.

Washington: Federal Aid Funds—$1,154,550. It is estimated that $8,500,000 will be spent by state and counties in 1919. A $30,000,000 bond issue is proposed.

West Virginia: Federal Aid Funds—$851,534. The counties will have about $16,000,000 available for road work this year.

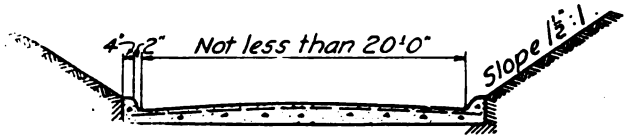
Wisconsin: Federal Aid Funds—$2,040,737. About $10,210,000 will be available, including federal aid; $3,760,000 under state aid law, $4,150,000 under federal aid law, and $2,300,000 for maintenance.

Wyoming: Federal Aid Funds—$980,309. The legislature has appropriated $300,000, and authorized voting on a $2,800,000 bond issue. About $500,000 will be available from county funds.

CONSTRUCTION OF HIGHWAYS IN CUTS.

A modification of the odinary treatment of highways in cuts is being adopted more or less widely where hard surface pavements are used, the most striking feature of the plan being the elimination of shoulders and gutters. Huron county, Ohio, adopted this plan as shown in the accompanying illustration. A single-track concrete road was widened to twenty feet and integral curbs provided. The side slopes of the cut were brought down flush with the top of the curb so that the water draining down the slopes passes directly onto the pavement and flows along the gutter of the same. We understand that the same plan is being adopted for the state highways of Illinois.

This plan eliminates the expense of maintaining shoulders and gutters on steep grades, where the wash is likely to be considerable, and the rutting of the shoulders



NO-SHOULDER ROAD ON GRADE OVER 4%.

along the edge of the pavement; allows the water to flow away rapidly without damaging the roadway, and materially reduces the amount of excavation. That the latter is the case is readily seen when it is considered that the introduction of a gutter throws the foot of the slope both further out and lower, thus greatly increasing the amount of material to be removed in excavating the side slopes. The pavement of course needs to be wider, allowing sufficient room for the passing of vehicles or for turning around, but the amount saved in excavation alone should go far toward meeting this additional cost, while the cost of maintenance of the pavement will probably be materially less than the combined maintenance of narrow pavement and of shoulders and gutters where the older construction is employed.

SNOW FENCES.

The use of snow fences for preventing drifting in railroad cuts is a practice of many years' standing, but it appears to be only during the past year or two that these fences have been employed along highways. The same principle, however, would of course apply to one as to the other. The illustration shows a snow fence on Lincoln Highway constructed by the State Highway Department of Pennsylvania.

The cost of such a fence is of course no small item, and if it is not thought worth while to endeavor to keep a road open during the winter, this expense would not be warranted. In the case of an important main highway, however, where modern conditions and opinions demand that it shall be passable for all vehicles every day in the year, it may be found that the construction and upkeep of snow fences along the sides of the deeper cuts would involve less expenditure than the removal of snow from such cuts during and after every snow storm; in addition to which it is to be considered that, where drifts tend to form, it is impracticable to keep snow plows or other apparatus at work on each cut continuously so as to prevent such formation, and therefore the snow fence would insure more continuous freedom from snow drifts than any reasonable amount of snow fighting.

SNOW FENCE ON LINCOLN HIGHWAY IN BEAVER COUNTY, PENNSYLVANIA.

BRIDGE FAILURES.

State and County.	Number of bridges on county roads.	Have any broken because too light for traffic?	How many are considered unsafe for the heaviest traffic?
Arkansas:			
Hempstead	Many	No	10
Little River	14	No	None
California:			
San Benito	11	No	2
Florida:			
Citrus	4 across river	No	None
Lake	6 steel, many wooden	No	50% of wooden bridges
Lee	About 1,000	No	None
Georgia:			
Chattahoochee	12 or 15	No	2 or 3
Lawrence	About 6 miles	Yes	Can't say
Liberty	Do not know	Yes	75%
Illinois:			
Christian	100 or more large ones	Yes	50%
DeWitt	About 1,000, all sizes	No	Not estimated
Marshall	About 1,300 bridges & culverts	Yes	5 to 10%
McDonough	Culverts & bridges average 5 per mile	Only old wooden bridges	5½%
McHenry	125	One	50% not safe for 12-ton engine
Stephenson	3,000	No	30%
Washington	2,000	Badly damaged.	About 50%
Whiteside	.....	No	10%
Williamson	2,400	No	Very few
Winnebago	About 2 per mile	Yes	75%
Woodford	4 per mile	No	6
Indiana:			
Dubois	Many small, 7 large	None	6 large (f)
Fountain	No idea	No	Several
Hancock	Not known	No	Very few
Howard	200	No	None
Jackson	Probably 350	Most must be strengthened or rebuilt soon.	About 50%
Marion	About 83	None	None
Randolph	Unknown	No	Very few
Tippecanoe	No record	No	3 or 4 small ones
Tipton	None	No	None
Vigo	500	10 or 15	300
Wayne	75	None	3
Iowa:			
Adair	39	No	16
Adams	About 800	Traction engines went through 3 or 4	About 100
Appanoose	About 1,700	Yes	Many
Bremer	2,700 culverts & bridges	No	12%
Cerro Gordo	3,800	No	166
Cherokee	About 600 bridges & culverts	No	None
Fayette	.....	Yes	Unknown
Greene	.....	....	50
Humboldt	About 1,150	Yes	10
Ida	About 400	One	Probably 10%
Jasper	....	No	About 75%
Johnson	Probably 1,500	No; kept heavy traffic off.	90% on main roads, 50% on secondary roads
Kossuth	950	No	....
Lee	.....	....	50%
Lyon	Several hundred	A few wooden bridges	10 to 15 old light steel ones
Mills	About 2,000	Several	About 30%
Muscatine	40 on county roads	No	4 on county roads
Mahaska	About 450	Some wood bridges	75
Osceola	About 1,300	No	All temporary ones
Palo Alto	About 1,100, culverts & bridges	Yes	About 20%
Sac	Average 5 waterways per mile	Yes	No estimate; some
Tama	About 8,000	Yes	50%
Kansas:			
Allen	356	Yes	50%
Anderson	About 50	No	None
Chase	22 large bridges	One	8
Doniphan	464 costing over $600	A few	20
Douglass	.....	....	....
Kingman	Count not completed	Yes	35
Labette	.....	No	None
Meade	.....	No	None
Ness	17 wood floors and piles	No	All
Republic	Do not know	Yes	....
Rooks	20	Yes	7
Sedgwick	About 1,000	No	60%
Wilson	Not known	No	4 or 5
Kentucky:			
Greenup	.....	No	One
Henderson	150 or more	Some wooden bridges	....
Hickman	1,400 bridges & culverts	100	200
Menifee	None	....	....
Morgan	15 steel, a number of wood	No	None
Nicholas	128	2 (e)	20
Oldham	43	Yes	....
Trimble	2 steel, several concrete	No	4 or more
Whitley	About 50	One	One
Louisiana:			
Caddo (Parish)	50 or more	10, all built for 10 or 15 tons	None
Jackson	4 or 5 steel	No	....
W. Feliciana	9	No	None
Maryland:			
Allegany	71 long; numerous small wooden ones	3 wooden ones	None of the 71
Anne Arundel	Large number	Yes	All steel & concr. bridges are safe
Kent	About 10	No	All of them next year; heavy traffic just beginning
Talbot	About 225, 16 ft. long & over	No	None
Wicomico	About 200	Some wooden bridges	Fully half
Michigan:			
Berrien	15 over 30 ft. span	No	None yet
Cass	About 90	No	About 50
Dickinson	9	No	One
Ingham	25	No	None
Kalkaska	40 or 50	No	None
Macomb	20 over 30 ft. span	No	14
Menonimee	6	No	None
Minnesota:			
Blue Earth	About 500	No	About 50%
Clay	20	No	....
Cottonwood	Only concrete culverts	Yes	Very few
Crow Wing	200 state, county & town	No	80% county & town
Goodhue	131, 10 ft. span up	No	One
Grant	15	No	None
Isanti	4	No	1
Itasca	95	Some have been strained	About 25
Jackson	16	Yes	3
Martin	25 about $3,000 each, many smaller	No	Not known
Morrison	About 10	No	None
Roseau	12	No	2
Todd	No figures	None	....
Mississippi:			
Coahoma	About 200	No	25 or more
Missouri:			
Butler	90 steel & concrete, a few wood	No	None of steel
Callaway	185	2, old rusty steel	75%
Clark	About 100	No	Very few
Harrison	About 100	No	About 50%
Jasper	About 130	No	About 20%
Lincoln	54 steel over 30 ft. (a)	No	Some old culverts
Miller	7	No	All
Monroe	.....	None	Many
Polk	50	No	None
Webster	2	None	None

BRIDGE FAILURES—(Continued).

State and County.	Number of bridges on county roads.	Have any broken because too light for traffic?	How many are considered unsafe for the heaviest traffic?
Montana:			
Granite	4 large, many small	....	....
Nebraska:			
Dakota	Not known	No	None
Fillmore	320	Yes	50%
Gage	About 120 large	No	20
Keyapaha	6	None	One
New Jersey:			
Burlington	500	Yes	400
Gloucester	Co. roads 62, twp. roads 650	3 old ones	Co. roads 3, twp. roads 35
Passaic	About 700	Yes	About 5%
Salem	.....	No	[a]2
Somerset	About 750	(b)	At least 10 large ones
Sussex	37	None	None
New Mexico:			
Luna	Very few	No	None
New York:			
Cayuga	339 under 20 ft. span, 137 over 20 ft.	No	10 to 20
Dutchess	1,006	Yes	20
Franklin	586 over 5 ft.	No	None
Herkimer	1,500	Yes	2/3
Niagara	160 from 5ft span to 380 ft.	One	All more than 10 years old
Orleans	402 5 ft. span or more	1 or 2	About 40%
Saratoga	670	2	40%
Wayne	369	3 or 4	10%
Yates	100	Yes	Most of them
North Carolina:			
Davidson	300	Yes	12
Wayne	Not known	All wood, yes	All
North Dakota:			
Divide	2	....	....
Ohio:			
Guernsey	About 4 per mile	No	10 or 15
Highland	.....	Yes	Many
Huron	.....	No	....
Madison	.....	No	3 or 4
Meigs	Quite a few	No	....
Muskingum	About 1,200	Yes	The majority
Wood	1,200	20	10
Oklahoma:			
Bryan	No data	Yes	About 75%
Craig	About 40	None	2
Garfield	Several hundred	No	....
Harper	About 15 good ones	No	None
Kingfisher	About 200	Yes	65%
McClain	3	No	None of late construction
Major	.....	No	Some wooden ones
Pennsylvania:			
Lebanon	About 30	Not in last 2 years	Limited to 10 tons
Mercer	.....	No	2
South Carolina:			
Florence	1,000 large & small	Yes	50%
Deuel	500	No	Some old wooden ones
Tennessee:			
Greene	38 large ones	No	50%
Hardin	About 50 steel	No	None
Haywood	About 300	Yes	100
Lewis	None yet	....	....
White	6	No	None
Texas:			
Castro	None	....	....
Cornal	2 long span, 5 culverts	No	One
Dallas	400	No	None on main roads, 50% on side roads
DeWitt	About 50	No	None
Floyd	4	No	None
Frio	28 or 30	Yes	None
Lubbock	One	No	None
Taylor	About 50	Yes	50%
Virginia:			
Greensville	Great many	No	A few wooden ones
Washington:			
Clarke	About 50	No	About 20
Columbia	50	No	None safe
Douglas	4 concrete, great many wood	No	Most of the wooden
Kittitas	About 60 under 30 ft., 14 longer	No	None
Lincoln	400	No, but require constant repair	About 5%
Pend Oreille	Several pile & frame	No	None
Pierce	About 50	Yes	About 12
Skamania	About 25	No; one condemned	20 (c)
Spokane	275 with over 30 ft. spans	2 or 3 small ones	Very few
West Virginia:			
Fayette	About 500	No	A few old timber bridges
Hancock	About 120, mostly small	No (d)	None
Harrison	200	No	10%
Monongolia	About 300 over 20 ft. span	No	....
Nicholas	14	No	None
Raleigh	5, all concrete	No	None
Webster	10	No	7 steel bridges
Wisconsin:			
Adams	About 50	....	None
Forest	.....	No	Old wooden ones
Grant	.....	No	None
Jefferson	17	No	2
Juneau	70	No	35
Outagamie	About 8	Yes	....
Sauk	400	None	One
Washburn	3 on federal trunk system	No	None
Wood	.....	No	None on main roads
Wyoming:			
Platte	About 75	No	15

[a]Bridges and culverts, 3 to mile. [b]Con tinually renewing bridges broken down by heavy traffic. [c]All of recent build safe. [d]A few small wooden bridges have broken from age and been replaced with stone or concrete. [e]Are gradually concreting all bridges. [f]All late bridges designed for 20-ton loads.

COUNTY WORK CONTEMPLATED FOR 1919.

State and County	Kinds of surface to be constructed	Amount	Will reinforcement be used in concrete pavements?	Distance between expansion joints
Arkansas:				
Hempstead	27 mi. brick or warrenite, 100 mi. gravel	125 mi.	....	....
Little River	Gravel	40 mi.	No	About 30'
California:				
San Benito	Macadam, 6½ mi.; gravel several mi.	....	....	....
Iowa (Continued)				
Sac	25 mi. gravel, 140 mi. maintenance	25 mi.	....	....
Tama	Dirt road	$45,000	....	....
Kansas:				
Allen	8 mi. macadam, 12 mi. concrete, 5 mi. gravel, 4 mi. resurface	29 mi.	Yes	30 ft.

Florida:				
Citrus	2.2 mi. concrete surface; 130 mi. repair work	2.2 mi.	Yes	10'
Lake	Street work	$125,000	No	50'
Lee	25 mi. grading; 25 mi. with local material	50 mi.	....	....
Georgia:				
Chattahoochee	Sand-clay roads	10 mi.	....	....
Laurence	Sand-clay	$130,000	No	....
Liberty	Sand-clay	50 mi.	No	....
Illinois:				
Christian	Oiled earth	$24,596	....	....
De Witt	5 or 6 mi. earth	$15,000	....	....
Marshall	12.5 mi. concr., 9.0 mi. grade and drain	21.5 mi.	No	....
McDonough	100 mi. oiled earth, 10 mi. earth	110 mi.	....	....
McHenry	Concrete	$25,000 (c)	No	50' on roads, 30' on city pavements
Stephenson	1 mi. brick	$23,000	No	None
Washington	Macadam or gravel	$16,000	....	....
Whiteside	23 mi. concrete, 10 mi. gravel	33 mi.	....	....
Williamson	3 mi. bituminous macadam, 5-7 mi. concrete	8-10 mi.	Yes	....
Winnebago	8¾ mi. concrete, ½ mi. brick	9 mi.	No	Don't use them
Woodford	Oiled earth	132,000 sq. yd.	No	....
Indiana:				
Adams	Macadam, 45 mi.	$261,000	....	....
Dubois	7 mi. macadam, 6½ mi. macadam treated	13½ mi.	No concrete paving	....
Hancock	25 mi. gravel, (5 mi. macadam (a)	30 mi.	Yes	30'
Howard	27½ mi. concr., asph. concr. stone macadam, gravel & brick	$300,000	Yes	30'
Jackson	Stone and gravel	4 mi.	Yes	25' to 30'
Marion	Concrete, 45 mi.; brick, 20 mi.; asphalt, 18 mi.	$590,000	Yes	End of each day's run
Randolph	20,000 sq. yd. brick; 10 mi. stone; 4 mi. gravel.	15 mi.	Yes	36'
Tippecanoe	6 mi. brick, 2 mi. concr., 20 mi. gravel	28 mi.	Yes	50'
Tipton	8 mi. brick	94,000 sq. yd.	Yes	30' to 35'
Vigo	20 mi. hard road; 20 mi. stone and gravel	40 mi.	Yes	33'
Wayne	20,000 sq. yd. rein. concr.; 275,000 sq. yd. plain concr.	295,000 sq. yd.	In part	36'
Iowa:				
Adair	Grading and maintaining	$20,000	....	....
Adams	Repairs, $15,000; 10 mi. permanent grades	....	I would	(b)
Appanoose	Permanent dirt road	$40,000	....	....
Bremer	2 mi. gravel, 3 or 4 mi. grading	5½ mi.	....	....
Cerro Gordo	7.5 mi. concrete, 10 mi. gravel	17.5 mi.	Yes	None
Cherokee	Dirt roads	15 mi.	....	....
Fayette	Earth road	$35,000	....	....
Humboldt	1¼ mi. paving, 10 mi. gravel	11¼ mi.	We will	About 35'
Ida	Maintenance	$14,000	....	....
Jasper	Dirt road, $30,000; gravel, $6,000	$36,000	....	....
Johnson	1.1 mi. hard surfacing, 10 mi. earth work	11.1 mi.	Yes	None
Kossuth	Earth grading and graveling	$50,000	....	....
Lee	Maintenance	....	....	....
Lyon	40,000 cu. yd. permanent grading	$15,000	....	....
Mills	Earthwork only	$30,000	....	....
Muscatine	7 mi. grading & clay surfacing	$51,000	....	....
Mahaska	Ordinary road work	$30,000	....	....
Osceola	20 blocks city pavement, 25 mi. gravel highways	27 mi.	Yes	25' to 50'
Palo Alto	Graveling	60 mi.	No	40'
Anderson	Hard surface	30 mi.	....	....
Chase	Concrete or brick	33 mi.	....	33'
Doniphan	Probably none till 1920	....	No	Not determined
Douglas	Kind not determined	18 mi.	No	....
Kingman	Grading	$15,894	....	....
Labette	Gravel road	22 mi.	....	....
Meade	Grading	30 mi.	....	....
Ness	Dirt roads	....	....	....
Republic	Improved earth	150 mi.	....	....
Rooks	Earth roads $10,000, gravel $2,000	$12,000	....	....
Sedgwick	7⅝ mi. concrete, 12 mi. brick	19⅝ mi.	No	....
Wilson	Gravel road	25 mi.	....	....
Kentucky:				
Greenup	Earth road	10 mi.	....	....
Henderson	12 mi., mostly gravel	$135,000	....	....
Menifee	About 2 mi. gravel	$8,000	No	....
Morgan	.....	$25,000	....	....
Nicholas	Waterbound macadam	$35,000	....	....
Oldham	Waterbound macadam	4 miles	....	....
Louisiana:				
Caddo	Gravel, asphalt surface	$200,000	....	....
Jackson	Graded & gravel	25-40 mi.	No	....
West Feliciana	Gravel	$350,000	....	....
Maryland:				
Allegany	Concrete, 14'-20' wide	$250,000	....	End of day's work
Anne Arundel	Gravel, shell, cinder, slag, concrete	$80,000	No	None
Kent	Macadam 4½ mi., concrete 3½ mi.	8 mi.	No	100 ft.
Talbot	None	....	No	60 ft.
Wicomico	Earth, sand-clay, shell, macadam, bit. mac., concrete	$50,000	No	....
Michigan:				
Berrien	Macadam 10 mi.; asph. concrete 2 mi.; brick 1½ mi.	13½	No	50 ft.
Cass	Gravel	60 mi.	Yes	25 to 33 ft.
Ingham	Gravel, 20 mi.; concrete, 1½ mi.	21½ mi.	Occasionally	35 ft.
Kalkaska	Gravel	2 mi.	Yes	30 to 50 ft.
Macomb	Gravel & slag, 20 mi.; asph. macadam, 3½ mi.; concrete, 6¾ mi.; asph. concrete, 10¼ mi.	40½ mi.	No	35 ft.
Menominee	Crushed gravel	2 mi.	....	....
Minnesota:				
Blue Earth	Earth and gravel	$60,000	....	....
Cottonwood	Grading, 50 mi.; gravel, 10 mi.	$120,000	....	....
Crow Wing	Grading and gravel, 25 mi.	$100,000	....	....
Goodhue	Grading, 18 mi.; gravel, 40 mi.	$149,000.	....	....
Grant	Earth, 5 mi.; gravel, 6 mi.	$53,000	....	....
Isanti	Grading and gravel	22 mi.	....	....
Itasca	Gravel, 35 mi.	$150,000	....	....
Jackson	Grading, 30 mi.	$60,000	....	....
Martin	Grading, 34 mi.; gravel, 30 mi.	$200,000	....	....
Morrison	Gravel, 60 mi.; concrete, 14 mi.	74 mi.	....	....
Roseau	Earth, 13½ mi.	$27,239	....	....
Todd	Grading, 20 mi.; gravel, 7 mi.	27 mi.	....	....
Mississippi:				
Coahoma	Gravel, 38 mi.; asphalt or concrete, 22 mi.	60 mi.	....	....
Missouri:				
Butler	Earth road foundation	$50,000	....	....
Callaway	Gravel and macadam	7½ mi.	....	....
Clark	Earth roads	50 mi.	....	....
Harrison	Concrete	9½ mi.	No	20 ft.
Lincoln	Gravel	14 mi.	Yes	20 ft.
Miller	Earth roads	$60,000	No	....
Monroe	Grading and culverts	$20,000	....	....
Polk	Gravel, 13½ mi.	$42,000	No	30 ft.
Montana:				
Granite	Earth, 10 mi.	$20,000	....	....
Nebraska:				
Dakota	Grade & surface	20 mi.	No	....

COUNTY WORK CONTEMPLATED FOR 1919—(Continued).

State and County	Kinds of surface to be constructed	Amount	Will reinforcement be used in concrete pavements?	Distance between expansion joints
Nebraska (Continued):				
Fillmore	Grading	35 mi.	....	....
Gage	Grading, 90 mi.; gravel, 35 mi.	125 mi.	....	....
New Jersey:				
Burlington	.....	$600,000	....	....
Gloucester	Concrete, 2 mi.; gravel, 2.6 mi.; bit. macadam, 1¼ mi.	5.9 mi.	Yes	33⅓ ft.
Passaic	Concrete, $190,000; bit. concrete, $168,000; granite, $175,000; asphalt, $40,000; surfacing $295,000	$868,000	Yes	35 ft.
Salem	Concrete, 4.76 mi.; asphalt, 2.61 mi.; gravel, 3.38 mi.	10.75 mi.	No	36 ft.
Somerset	Macadam	$58,500	....	....
Sussex	.....	$300,000	....	....
New Mexico:				
Luna	Gravel	$65,000	....	....
New York:				
Cayuga	Macadam (and maintain 90 mi.)	20 mi.	....	....
Dutchess	Gravel, 10 mi.; concrete, ½ mi.; bit. macadam, 2 mi.	12½ mi.	No	35 ft.
Franklin	Bit. resurfacing 3" thick	7 mi.	....	....
Herkimer	Macadam	$650,000	No	30 ft.
Niagara	Bit. macadam, 13 mi.; concrete, 8 mi.	$376,000	Some	30 to 32 ft.
Orleans	None	....	....	....
Saratoga	Concrete, 3½ mi.; others, $110,000	$185,000	Over clay	30 ft.
Wayne	Macadam, 10¼ mi.; gravel, 19 mi.	$88,973	....	....
Yates	.....	12½ mi.	No	30 ft.
North Carolina:				
Davidson	Concrete, 12 mi.; sand-clay, 25 mi.	37 mi.	Will	30 ft.
Mitchell	.....	$100,000	....	....
Wayne	Sand-clay and concrete	$70,000	....	....
North Dakota:				
Divide	.....	10 mi.	....	....
Ohio:				
Guernsey	Grading, 2 mi.; macadam, 3 mi.; concrete, 5 mi.; brick, ¼ mi.	10¼ mi.	No	50 ft.
Highland	Tar macadam, $250,000; macadam, $300,000; bridges, $120,000; maintenance, $62,000	$732,000	No	....
Huron	Concrete, 16 mi.; brick, 4 mi.	20 mi.	On 16' or wider	75 ft.
Madison	Tar macadam, 5.92 mi.; concrete, 2.5 mi.	8.42 mi.	Yes	60 ft.
Meigs	Tar macadam, 10 mi.	$200,000	....	....
Muskingum	Brick, 6½ mi.; concrete, 9 mi.	$495,000	No	60 ft.
Wood	Concrete, 57,000 sq. yd.; asph. concrete, 77,000 sq. yds.; bit. macadam, 70,000 sq. yd.	204,000 sq. yd.	Yes	40 to 100 ft.
Oklahoma:				
Bryan	Concrete	25 mi.	....	....
Craig	.....	$55,000	....	....
Garfield	Earth work	$75,000	No	25 to 33 ft.
Harper	Earth roads	10 mi.	....	....
Kingfisher	Earth roads and bridges	$80,000	....	....
Major	Grading	10 mi.	....	....
McClain	.....	$20,000	....	....
Pennsylvania:				
Lebanon	Macadam, 10 mi.; tarvia, 3 mi.	13 mi.	....	....
Mercer	None by county	....	Yes	30 ft.
South Carolina:				
Florence	Hard surface, $45,000; sand-clay, $40,000	$85,000	....	....
South Dakota:				
Deuel	Gravel	$60,000	....	....
Tennessee:				
Greene	Grading, 50 mi.; macadam, 50 mi.	$500,000 (c)	No	....
Haywood	Grading	25 mi.	....	....
Lewis	Gravel and chert	50 mi.	....	....
White	Macadam—quite a lot	....	....	....
Texas:				
Castro	Earth roads	30 mi.	....	....
Dallas	.....	$500,000	Yes	150 ft.
Trio	Only repairing	....	....	....
Lubbock	Dirt roads	....	....	....
Taylor	Gravel, 50 mi.; earth, 20 mi.	$150,000	....	....
Virginia:				
Greensville	Resurfacing sand-clay by towns	....	....	....
Washington:				
Clarke	Concrete and bitulithic	33 mi.	No	30 ft.
Columbia	Macadam	1½ mi.	....	....
Kittitas	Crushed gravel, 5 mi.	$23,000	No	30 ft.
Lincoln	Grading and gravel	$100,000	....	....
Pend Oreille	Gravel	2.42 mi.	....	....
Pierce	Total pavement, 6 mi.	$120,000	Some	30 ft.
Skamania	Gravel & broken stone, 50 mi.	$50,000	....	....
Spokane	Concrete, 180,000 sq. yds.	$350,000	Where subgrade is weak	30 ft.
West Virginia:				
Fayette	Concrete, $300,000; asph. concrete, $100,000; asph. macadam, $200,000	$600,000	No	End of day's work
Hancock	Brick, 4.5 mi.; concrete, 5 mi.	9.5 mi.	No	....
Monogalia	Concrete, 5 mi.; grading, 2 mi.	$150,000	In places	Not used
Nicholas	Improved dirt	10 mi.	....	....
Raleigh	Bit. macadam, 20 mi.; grading, 20 mi.	40 mi.	No	30 ft.
Webster	Improved dirt	10-20 mi.	....	....
Wisconsin:				
Adams	Gravel, 1 mi.; sand-clay, 10 mi.	11 mi.	....	....
Forest	Grading, 25 mi.; gravel, 6 mi.	$90,000	....	....
Grant	Concrete, $2,000; macadam, $15,000; grading, $80,000	$97,000	....	....
Jefferson	.....	$160,000	....	....
Juneau	.....	$40,000	....	....
Outagamie	Concrete, 28 mi.	$520,000	....	....
Sauk	Gravel, macadam & bridges	$200,000	No	35 ft.
Washburn	Mostly grading	$30,000	....	....
Wyoming:				
Platte	Earth road, 75 mi.	$10,000	....	....

a—possibly some brick and concrete; b—every time work is stopped for more than one hour; c—total amount of cash available.

RESULTS OF HEAVY TRAFFIC.

State and County.	Greatest weight of combined load and truck using highways	Legal limit of weight	Have any roads been damaged by heavy trucks?	What changes have been made in road construction because of heavy trucks?	Are such changes contemplated or recommended?
Arkansas:					
Hempstead	7 tons	None	Yes	To hard surface	....
California:					
San Benito	.....	None	Yes	None	No
Florida:					
Citrus	3 tons	None	Yes	Rock instead of clay for repairs; new roads concrete	....
Lake	5 tons	None	Yes	Better foundations	....
Lee	3 tons	None	No	None	....
Georgia:					
Chattahoochee	2 tons	None	No	None	....
Laurens	10 tons	None	Yes	None	For bridges
Liberty	6 tons	None	Yes	None	Recommend restricting loads
Illinois:					
Christian	6 tons	None	Yes	None	Yes
DeWitt	5 tons	None	Yes	None	....
Marshall	10 tons	None	Earth and gravel badly	Better culverts and bridges	Yes
McDonough	8 tons	None	....	....	....
McHenry	4 tons	None	Township gravel roads	None	....
Stephenson	5 tons	None	No	Increase concrete base	Recommend limiting weight
Washington	....	None	Yes	....	Yes
Whiteside	10 tons	None	Yes	None	Recommended
Williamson	5 tons	....	No	None	No
Winnebago	15 tons	None	Yes	From macadam and gravel to concrete	....
Woodford	3½ tons	....	No	None	By the state
Indiana:					
Adams	5 tons	None except on soft roads	Yes	None	Yes
Dubois	3 tons	None	No	None	Yes
Hancock	Heaviest in use	By wheel width	Yes	Changing to hard surface	....
Howard	4 to 8 tons	None	Gravel and macadam	Change to hard surface	....
Jackson	7 to 8 tons	1,000 lb. per inch width of tire	Earth, gravel and macadam	Better drainage and grading, thicker metal	Yes
Marion	6 tons	None	Yes	All roads hard surface	....
Randolph	8 tons	....	Yes	Main roads hard surface	....
Tippecanoe	8 tons	5 tons	Yes	Better drainage; hard surface for some	....
Tipton	9 tons	None, if tires wide	Yes	....	Hard surface demanded
Vigo	20 tons	....	Yes	Hard surface	....
Wayne	7 tons	10 tons	Gravel, in soft weather	Hard surface	All main highways to be hard surface
Iowa:					
Adair	8 tons	None	....	....	....
Adams	6 tons	None	All dirt roads	....	Should be
Appanoose	2 tons	....	Yes	None	Recommended
Bremer	5 tons	....	All dirt roads	....	Surfacing necessary
Cerro Gordo	8 tons	None	Yes	Change from gravel to concrete	....
Cherokee	3½ tons	....	Dirt roads	....	Will in near future
Fayette	2½ tons	None	Yes	Not yet	Yes
Humboldt	7 tons	None	Gravel roads	Pave main roads, increase depth of gravel on others	....
Ida	7 tons*	None	No	None	Yes
Jasper	5 tons	None	Yes	....	....
Johnson	8-10 tons	None	Yes	None	Some day
Kossuth	3 tons	None	No	None	....
Lee	3½ tons	None	Earth roads	....	....
Lyon	3 to 4 tons	....	....	....	....
Mahaska	6 tons	None	Yes	None	Should be limit to speed and load
Mills	7½ tons	None	All earth roads	....	....
Muscatine	12-14 tons	None	Yes	None	Will build for heavier traffic
Osceola	8 to 10 tons	None	Yes	Thicker base, better construction	....
Palo Alto	7 tons	None	Earth roads	....	....
Sac	6 tons	None	Gravel and earth nearly ruined	Not yet	Must pave main roads, heavier gravel on side roads
Tama	5 tons	None	Dirt roads	Increased width	....
Kansas:					
Allen	10 tons	None	Yes	....	Recommend
Anderson	2 tons	None	No	None	....
Chase	5 tons	None	No	Will use hard surface	....
Doniphan	6 tons	....	Earth roads	....	....
Douglas	3 tons	None	....	....	....
Kingman	13 tons	....	After rains	None	....
Labette	.....	None	No	None	....
Ness	.....	None	No	....	....
Republic	3½ tons	None	....	....	....
Rooks	5 tons	None	No	None	....
Sedgwick	9 tons	....	Only earth	....	....
Wilson	10 tons	None	Earth and gravel	None	....
Kentucky:					
Greenup	5 tons	....	No	None	....
Henderson	7 tons	15 ton	Yes	Increase thickness, improve drainage	....
Morgan	5 tons	None	Very little	None	No
Nicholas	10 tons	None	Yes	Not yet	Yes
Oldham	6 tons	....	Yes	None	Yes
Louisiana:					
Caddo	9 or 10 tons	None	Considerably	Change to asph. concrete	....
West Feliciana	1 to 2 tons	None	No	....	....
Maryland:					
Allegany	10 tons	None	Yes	....	Will abandon macadam and thicken concrete
Anne Arundel	11 tons	650 lbs per inch width of tire	Yes	Use only concrete for main roads	....
Kent	7 tons	About 7 tons	No	None	No
Talbot	6 tons	None	No	....	Use concrete for improved roads
Wicomico	10 tons	....	Yes	Abandoned shell, treat macadam with tar or asph.	Recommend concrete, 6 in. min. thickness

RESULTS OF HEAVY TRAFFIC—(Continued).

State and County.	Greatest weight of combined load and truck using highways.	Legal limit of weight	Have any roads been damaged by heavy trucks?	What changes have been made in road construction because of heavy trucks?	Are such changes contemplated or recommended?
Michigan:					
Berrien	12 tons	Depends on wheel base	No	None	Will increase base 20%
Cass	10 tons	Depends on wheel base	Yes	None yet	Yes
Ingham	10 tons	Depends on wheel base	Yes	In some places concrete replacing gravel	....
Kalkaska	15-18 tons	....	No standard roads	None	When trucking becomes heavy
Macomb	9-11 tons	Depends on wheel base	Yes	Increase depth and improve quality	....
Menominee	10 tons	....	No	None	No
Minnesota:					
Blue Earth	4 tons	None	A great deal	None yet	Recommend concrete
Cottonwood	6 tons	None	Yes	....	Propose concrete
Crow Wing	5 tons	None	No	....	Contemplate paving
Goodhue	.....	None	....	Concrete will replace gravel	....
Grant	3 tons	None	Yes	None	Yes
Isanti	8 tons	None	Yes	None yet	Yes
Itasca	12 tons	....	No	Pavement instead of gravel	Yes
Jackson	5 tons	None	Yes	Paving trunk lines	Yes
Martin	Few trucks	None	No	None	....
Morrison	5 tons	None	Yes	Gravel and concrete	....
Todd	3½ tons	....	Somewhat	None yet	....
Mississippi:					
Coahoma	12 tons	None	No	None	No
Missouri:					
Butler	1 to 6 tons	None	No	More permanent type	Yes
Callaway	6 tons	None	Yes	....	Need better surfaces
Clark	7 tons	....	No	....	Some hard surface
Harrison	1½ to 2 tons	....	No	None	....
Lincoln	4 tons	None	No	None	In the future
Miller	3 tons	None	Somewhat	Will change from earth to chert or gravel	....
Polk	3 tons	None	Yes	Thicker gravel surface	....
Montana:					
Granite	12 tons	....	....	....	....
Nebraska:					
Dakota	.....	None	Yes	None	....
Filmore	6 tons	None	Dirt roads	....	Contemplate permanent roads
Gage	4 tons	....	Yes	None	....
New Jersey:					
Burlington	15 tons	15 tons	Yes	Better foundation and surface	....
Gloucester	18 to 20 tons	....	Yes	Reinforce concrete and heavier pavements	....
Passaic	15 tons	15 tons	Yes	Thicker foundation; concrete roads 10 in. at center.	....
Salem	15 tons	....	Yes	From gravel to concrete	....
Somerset	12 to 15 tons	None	Several	None yet	Recommend
Sussex	8 tons	....	Yes	Trying to get concrete	....
New Mexico:					
Luna	5 tons	None	Yes	From 6"x12' gravel to 10"x18'	....
New York:					
Cayuga	9 tons	12½ tons	Yes	Increase thickness 25%, improve drainage	....
Dutchess	12 tons	None	Yes	8" to 18" sub-base	....
Franklin	8 tons	....	very much	Sub-base 6" to 12"	....
Herkimer	20 tons	None	Yes	None	Recommend load limit
Niagara	15 tons	....	Yes	Use brick and concrete	....
Orleans	8 tons	None	Very little	None	....
Saratoga	15 tons	None	Yes	Use concrete	....
Wayne	....	None	Yes	Heavier base	....
Yates	15 tons	8 on bridges	Yes	None	Weight should be limited
North Carolina:					
Davidson	5 tons	None	Sand-clay	....	Yes
Wayne	7 tons	5 tons	Yes	From gravel to concrete	....
Ohio:					
Guernsey	7 tons	800 lb. per in. of tire at 10 miles per m.	Yes	None	Yes
Highland	5 tons		Yes	Increase thickness	....
Huron	12 tons		Some	Concrete or monolithic brick	....
Madison	10 to 12 tons		Very little	Concrete and bit. concrete	....
Meigs	10 tons		Yes	Better foundation	....
Muskingum	15 tons		No	Thicker macadam	....
Wood	12 tons		Yes	Heavier foundation	....
Oklahoma:					
Bryan	3 tons	None	Yes	Something better than macadam or gravel	....
Craig	5 tons	5 t. at 15 mi.	No	Heavier bridges	....
Garfield	8 to 10 tons	....	Yes	Concrete replaces dirt	....
Harper	1 ton	....	Yes	....	Propose hard surface
Kingfisher	5 tons	....	....	Flattened grades, widened road	....
Major	4 tons	....	....	....	....
McClain	2 tons	None	Very little	....	No
Pennsylvania:					
Lebanon	10-12 tons	None	All macadam	Not yet	More hard-surface roads to distribute traffic
Mercer	11 tons	§None	Not seriously	Macadam to concrete	....
South Carolina:					
Florence	5 tons	"Reasonable"	Yes	Better drainage, thicker sand-clay surface	Change from sand-clay
South Dakota:					
Deuel	3 tons	None	Not much	....	....
Tennessee:					
Greene	7 tons	None	Yes	None	No
Haywood	1½ tons	None	No	None	No
Lewis	3 tons	None	No	None	No
White	3 tons	None	Not much	None	....
Texas:					
Castro	3 tons	....	Only chuck holes	None	No
Dallas	11 tons	....	Yes	Use more cement and bitumen	....
Frio	Army trucks	None	Yes	None	....
Lubbock	4 tons	None	Somewhat	None	....
Taylor	12 tons	None	Yes	Stronger bridges	....

RESULTS OF HEAVY TRAFFIC—(Continued).

State and County.	Greatest weight of combined loan and truck using highways	Legal limit of weight	Have any roads been damaged by heavy trucks?	What changes have been made in road construction because of heavy trucks?	Are such changes contemplated or recommended?
Virginia:					
Greensville	3½ tons	....	Yes	None	No
Washington:					
Clarke	12 tons	12 tons	Yes	Make pavements heavier	....
Columbia	10 tons	None	Yes	None	....
Kittitas	7 tons	None	Gravel, in Spring	None	No
Lincoln	8 tons	7 tons	Yes	Will use more gravel, and hard surface on some	....
Pend Oreille	3 tons	400 lb. per in. tire width	Somewhat	None	No
Pierce	12 tons	....	Yes	None	....
Skamania	8 tons	None	Yes	....	Limit loads
Spokane	10 tons	10 tons	Yes	Require 5" concrete instead of asphalt base under asphalt pavement	....
West Virginia:					
Fayette	7 tons	600 lb. per in. tire width	No	None	....
Hancock	12 tons	15 tons	Yes	Heavier base	....
Harrison	10 tons	600 lb. per in. tire width	Yes	All concrete foundations	....
Monongalia	14 tons	600 lb. per in. tire width	All paved before 1917	Heavier roads and foundations	....
Raleigh	3 tons	600 lb. per in. tire width	No	Increase foundation stone to 8"	....
Webster	No trucks	15 tons	No	None	No
Wisconsin:					
Adams	3 tons	None	No	....	Yes
Forest	....	None	....	Graveling	....
Grant	8 tons	None	Yes	Heavier, more permanent roads	....
Jefferson	5 tons	None	Not much	None	Recommend concrete
Juneau	3 tons	None	No	None	No
Outagamie	7 tons	None‡	No	Concreate instead of macadam	....
Sauk	11 tons	Bridge, 15 tons	No	Not yet; concrete and tar macadam in 1921	....
Washburn	5 tons	None	Not much	Widening roadway	....
Wyoming:					
Platte	5 tons	None	No	None	No

*Only one truck of over 4 tons uses roads. †5-ton limit legislation contemplated. ‡Legislation pending.

PAVEMENT GUARANTEES.

State and County.	Are highway contractors required to give bonds?	Period of guarantee.	"Do you consider guarantee desirable for all kinds of pavements?"	If not for all, for what kinds?
Arkansas:				
Hempstead	....	....	Yes	....
Little River	Yes	2 or 3 years	No	Where gravel or base is bad
California:				
San Benito	No	....	....	....
Florida:				
Citrus	Yes	1 year	Yes	....
Lake	No	....	No	Only asphalt
Georgia:				
Chattahoochee	Don't contract	....	....	....
Liberty	No contract work except bridges	4 to 10 years	Yes	....
Illinois:				
Dewitt	Yes	....	....	....
Marshall	No	....	No	None
McHenry	No	....	No	Asphalt
Stephenson	No	....	No	....
Washington	No	....	....	....
Whiteside	No	....	....	....
Williamson	No	....	No	Bituminous macadam
Winnebago	No	To satisfactory completion of work	No	None
Woodford	Yes		No	....
Indiana:				
Adams	Yes	1 year	Yes	....
Dubois	No	....	No	Concrete, wood block or brick
Hancock	Not yet; recommended it	....	No	Brick, concrete & perhaps others
Howard	Yes	10 years	Yes	....
Jackson	No	None	No	None
Marion	Yes	5 years	No	For all hard surface
Randolph	No	....	....	....
Tippecanoe	Yes	5 years	....	Hard surface only
Tipton	No	....	....	....
Vigo	Sometimes	5 years	No	None
Wayne	No	None	No	None
Iowa:				
Adams	....	....	....	....
Appanoose	Yes	5 years	Yes	When contractor uses own specifications
Cerro Gordo	No	....	No	....
Fayette	Yes	....	Yes	....
Humboldt	Yes	3 years	Yes	....
Ida	No	....	....	....
Mahaska	Grading contractors	1 year	Yes	....
Mills	....	....	....	....
Muscatine	In City of Muscatine	5 years	No	Asphalt, bitulithic and similar types
Osceola	Not yet	....	Only part	All asphaltic
Palo Alto	Yes	5 years	No	Concr. & asphalt
Tama	....	....	....	....
Kansas:				
Anderson	Yes	....	Yes	....
Allen	Yes	Not determined	Yes	....
Chase	No	....	No	....
Doniphan	Yes	....	No	Concrete, asphalt and brick
Douglas	Will be required	Not determined	Yes	....
Labette	Yes	....	....	....
Ness	Yes	5 years	....	....
Sedgwick	No	....	No	....
Wilson	No contracts	....	....	....
Kentucky:				
Henderson	No	....	No	No kind
Menifee	Yes	1 year	....	....
Morgan	Yes	Varying	Yes	....

PAVEMENT GUARANTEES—(Continued).

Kentucky (Continued):				
Nicholas	No	....	No	Asphalt, brick & sometimes concr.
Louisiana:				
Jackson	Yes	....	Yes	....
Maryland:				
Allegany	No	....	No	....
Anne Arundel..	Only on patented pavement	5 years	No	Only patented pavements
Kent	....	Until work is completed	No	....
Talbot	No	....	No	In no case
Wicomico	Only on State work	....	....	....
Michigan:				
Berrien	On brick	5 years	No	Brick & asphalt
Cass	No	....	No	None
Ingham	No	....	No	....
Kalkaska	Yes	10 years	Yes	....
Macomb	On concrete and asphaltic concrete	1 to 5 years	No	Concrete & asphaltic concrete
Minnesota:				
Goodhue	No	....	....	....
Isanti	Yes	Not determined	....	....
Itaska	No	....	No	None
Morrison	On all contracts	Until work is completed	Yes	....
Mississippi:				
Coahoma	Yes	Engineer's discretion	Yes	....
Missouri:				
Callaway	On work by special road districts	Until work is completed	....	For better types
Harrison	Yes	....	No	Streets, public highways
Lincoln	No	....	....	....
Polk	....	....	....	....
New Jersey:				
Burlington	Maintenance	1 year	No	None
Gloucester	For faithful performance of contract	Until final acceptance	Yes	....
Passaic	For faithful performance of contract	1 to 2 years	Yes, not over 2 years	....
Salem	Yes	1 year	Yes	....
Somerset	No	....	No	Asphalt
Sussex	Under state aid specifications	1 year	No	None
New Mexico:				
Luna	....	....	Yes	....
New York:				
Cayuga	Work by force account	....	....	....
Dutchess	Work by town labor	....	Yes	....
Herkimer	Yes	Until completion of work	....	....
Niagara	No	....	No	None
Saratoga	Yes	3 yrs. for brick, none for concrete	No	None
Wayne	Work by force account	....	No	....
Yates	Work by county	....	Not where specifications are controlling	None
North Carolina:				
Davidson	Yes	2 years	Yes	....
Wayne	Yes	5 years	....	....

North Dakota:				
Divide	Yes	Until completion of work	....	....
Ohio:				
Guernsey	No	....	Yes	....
Highland	No	....	No	Hard surface
Huron	No	....	....	....
Madison	No	....	No	None
Meigs	Yes	....	....	....
Muskingum ...	No	....	No	....
Wood	No	....	No	None
Oklahoma:				
Bryan	No	....	No	....
Craig	Yes	5 to 10 years	No	Concrete & brick
Garfield	Yes	5 years	No	Bituminous
Harper	Yes	To completion of work	Yes	....
McClain	Yes	Until work is complete	....	....
Pennsylvania:				
Lebanon	Work by force account	....	....	....
Tennessee:				
Greene	No	....	No	None
Haywood	No	....	....	....
Lewis	Yes	Until contract is finished	Yes	....
White	No	....	....	....
Texas:				
Castro	....	....	Yes	....
Dallas	No	....	No	Any kind, under certain conditions
Taylor	No	....	....	Not for gravel roads
Virginia:				
Greensville	Yes	....	....	....
Washington:				
Clarke	No	....	No	Concrete bitulithic & asphaltic concr.
Columbia	Yes	Until work is completed	....	....
Kittitas	Macadam, no; bituminous, yes	....	No	Brick, bituminous
Lincoln	No	....	No	....
Pend Oreille ...	No	....	No	....
Pierce	No	....	No	None
Skamania	Yes	Till work is accepted	Yes	....
Spokane	No	....	No	None
West Virginia:				
Fayette	No	....	....	None
Hancock	No	....	No	None
Harrison	No	....	No	....
Monongolia	No	....	No	None
Nicholas	Work by day labor	....	....	....
Raleigh	Yes	....	....	....
Webster	No	....	....	....
Wisconsin:				
Forest	No	....	....	....
Grant	Yes	Until contract is completed	Yes	....
Jefferson	Yes	Until work is finished	....	....
Outagamie	No	....	No	Only sheet asphalt
Saulk	Yes	Till final acceptance	No	Concrete
Washburn	Work by day labor	....	....	....

CONTRACT WORK.

State and County	Form of contract that is favored	Is there abundance of unskilled labor in county?	Wages paid this year	Wages prior to 1917
Arkansas				
Hempstead	Straight contract	Yes	$2.50	$1.50
Little River	Straight contract	No; will be in 30 days	25c to 35c	15c to 20c
California:				
San Benito	Straight contract	No	$3.00 to $3.50	$2.00 to $2.50
Florida:				
Citrus	Day labor	Yes	$2.00 to $3.00	$1.25 to $1.50
Lake	Straight contract	No	$2.00 to $2.50	$1.25 to $1.75
Lee	Straight contract	No	$2.50 to $3.00	$2.00
Georgia:				
Laurence	.....	No	....	....
Liberty	Contract work, contractor to furnish all material	No	$2 and up	$1.00 to $1.50
Illinois:				
Christian	Contract	Yes	40c	25c
De Witt	Contract	No	25c to 50c	30c
Marshall	Contract, authorities furnishing material; or cost plus percentage	No	30c to 36c	25c
McDonough	Straight contract on concrete bridges and S. A. R. work; day labor on oiled earth roads	No	$3.50	$2.75
McHenry	.....	No	40c	$2.00 to $2.50
Stephenson	Straight contract, but protect contractor on freight rates	Sufficient	$3.50 to $4.00	$2.00 to $2.50
Washington	Contract	Yes	$3.00 to $3.50	$2.00 to $2.50
Whiteside	County furnish materials, contractor do work	Plenty	35c to 45c	20c to 25c
Williamson	Contract, material furnished by county	Yes	50c to 75c	25c to 40c
Winnebago	.....	No	50c	40c
Woodford	Straight contract	No	30c to 40c	20c to 30c
Indiana:				
Adams	Straight contract	Yes	25c	about 17½c
Dubois	Straight contract	Yes	$2.75 to $3.00	$1.50 to $2.00
Hancock	Straight contract	Yes	35c	20c
Howard	Straight contract	No	$3.00 to $4.00	$2.00 to $2.50
Jackson	Contract, county furnishing materials	Sufficient	30c to 40c	20c
Marion	Straight contract	Yes	38c	$2.25 to $2.50
Randolph	Straight contract	No	30c to 40c	25c to 30c
Tippecanoe	Straight contract	Yes	25c to 30c	25c
Tipton	Cost plus definite profit	No	30c to 50c	20c to 27½c
Vigo	Straight contract	Yes	$3.00 to $3.50	$1.50 to $2.25
Wayne	Straight contract	No	40c	27½c to 30c
Iowa:				
Adair	All work done by day labor	....	35c to 42½c	27½c to 37½c
Adams	Local conditions favor day labor	Will be shortly	40c	35c
Appanoose	Straight contract	Yes	$3.00 to $3.50	$2.50
Bremer	Day labor	No	$3.00	$2.00
Cerro Gordo	Contract, county furnishing material	No	40c	30c
Cherokee	Straight contract	No	40c to 45c	27½c to 35c
Fayette	Day labor cheapest if right men at the head; otherwise contract	No	40c	30c
Humboldt	Straight contract	Not if we carry out program	$3.50 or $4.00	About $2.75
Ida	Day labor on concrete work, if foreman competent	Yes	45c	25c
Jasper	Day labor	Yes	$4.00 to $5.00	$2.50 to $3.00
Johnson	Straight contract	Yes	40c	25c to 30c
Kossuth	Straight contract	Plenty	50c	30c
Lee	Day labor	....	$3.50 to $4.00	$2.50
Lyon	Straight contract; day labor on small work	Enough	$4.00 to $6.00	$3.00 to $4.00
Mahaska	Straight contract	Not at present	$3.00	$2.50
Mills	Straight contract and day labor	Yes	35c	25c to 30c
Muscatine	Straight contract	No surplus	30c to 40c	25c to 35c
Osceola	All to suit variable conditions	Yes	25c to 40c	20c to 30c

State and County	Form of contract that is favored	Is there abundance of unskilled labor in county?	Wages paid this year	Wages prior to 1917
Iowa (Continued):				
Palo Alto	Road work by contract; bridge work by day labor	Not an abundance	$4.00 to $5.00	$2.50 to $3.00
Sac	Straight contract	Not an abundance	$4.00	$2.75 to $3.00
Tama	Straight contract	Plenty at present	35c to 45c	30c
Kansas:				
Allen	Contract, county furnishing labor	Rather scarce	40c	25c
Anderson	Straight contract	Yes	25c	20c
Chase	Straight contract	Yes	40c to 50c	30c
Doniphan	Straight contract; small jobs by day labor	No	$3.00	$2.00
Douglas	Straight contract	Yes	$2.50 and up	$1.50 to $2.00
Kingman	County furnishing material, or cost plus	Yes	35c	25c
Labette	Straight contract	Yes	$2.00 to $2.50	$1.50 to $2.00
Meade	Day labor	No surplus	....	....
Ness	.....	Yes	40c	25c to 30c
Republic	Contract, county furnishing material	Scarce	$2.50 to $3.00	$2.00 to $2.50
Rooks	Day labor	Yes	40c	30c
Sedgwick	Contract, county furnishing material; some cases, day labor	Fair supply	$3.50 to $4.00	$2.00 to $2.50
Wilson	Force account	No	35c	25c to 50c
Kentucky:				
Greenup	Straight contract	Yes	$1.75 to $2.25	$1.50 to $2.00
Henderson	Straight contract, also county labor	Yes	$2.00 to $2.50	$1.50
Menifee	.....	No	$2.00	$1.50
Morgan	Day labor	Yes	$2.50	$1.50
Nicholas	Day labor, 1st; straight contract, 2nd	No	$2.50 to $3.00 (10 hours)	$1.50 to $1.75
Oldham	Contract work	No	$2.00 to $3.00	$1.50 to $2.50
Louisiana:				
Parish of Caddo	Force account	No abundance or shortage	$2.50	$1.75 to $2.00
Jackson	Straight contract	Yes	$2.00 to $3.00	$1.25 to $1.75
West Feliciana	Straight contract; cost plus is all right	Yes	$1.50	$1.00
Maryland:				
Allegany	Cost plus a definite profit	No	$3.00 (8 hours)	$2.00 (9 hours)
Anne Arundel	Straight contract; day labor for repairs and small work	Scarce last year, getting more abundant	$2.50 to $3.00	$1.50
Kent	Straight contract or day labor	No	$2.50 to $3.00	$1.75
Talbot	Straight contract for new work; day labor for maintenance	No	27½c	16 2/3c
Wicomico	Under $100,000, day labor; over that, straight contract	Sufficient	$2.00 to $2.25	$1.50 to $1.75
Michigan:				
Berrien	Straight contract	Will be shortage when work all started	35c to 40c	$2.75 (10 hrs)
Cass	Cost plus definite profit, and day labor	No	$3.50	$2.00 to $2.50
Ingham	Day labor	Generally, yes; some places, no	$3.00 (10 hrs.)	$2.25
Kalkaska	Day labor	No	$2.75 to $3.00	$1.75 to $2.00
Macomb	Straight contract, also county furnishing material	At present, yes	40c to 45c	25c to 30c
Menominee	Day labor	No	$2.50 to $3.00	$1.75 to $2.00
Minnesota:				
Blue Earth	All day labor	Yes	40c	25c to 30c
Cottonwood	Day labor, county furnishing material	Yes	30c to 40c	....
Crow Wing	....	Yes	35c	27½c to 30c
Goodhue	Straight contract	No	$3.00	$2.50
Grant	Straight contract	No	35c	25c
Isanti	Straight contract, 1st; county crew, 2nd	Yes	35c	30c

CONTRACT WORK (Continued)

State and County	Form of contract that is favored	Is there abundance of unskilled labor in county?	Wages paid this year	Wages prior to 1917
Minnesota— (Continued)				
Itaska	Straight contract	No scarcity	$3.50	$2.25
Jackson	Day labor; contract work by cost plus percentage	No	45c	$2.75 to $3.00
Martin	$80,000 to be done by day labor; $120,000 by contract	No	$40 to $60 per month	$40 per month
Morrison	Straight contract, county furnishing material	Not last year	$3.00	$2.00
Roseau	Straight contract, county crews on standard culverts and small bridges	Yes	30c to 35c	30c to 35c
Todd	Day labor	....	....	....
Mississippi:				
Coahoma	Contract, county furnishing material	Fair	$1.50 to $3.00	$1.25 to $2.00
Missouri				
Butler	Straight contract	No	25c to 50c	20c to 40c
Callaway	Straight contract	No	About 30c	About 20c to 25c
Clark	Straight contract	Average conditions	30c	20c
Harrison	.....	Yes	$3.00 (10 hr.)	$2.00 to $2.50
Lincoln	Straight contract, but operate under force accounts	No	$2.50 to $3.00	$1.25 to $2.50
Miller	Force account, with good foreman	Yes	$2.00 to $3.00	$1.50 to $2.00
Polk	.....	Yes	$2.00	$1.20
Montana:				
Granite	Straight contract	Plenty	$4.00	$3.00 to $3.50
Nebraska:				
Dakota	Not decided	No	$4.00	$2.50 to $3.00
Fillmore	Cost plus percentage profits	No	$3.50 to $4.00 (10 hrs)	$2.00 to $2.50
Gage	Day labor	No	35c to 50c	20c to 30c
New Jersey:				
Burlington	Contract	Yes	$3.00 (9 hrs)	$1.75
Gloucester	New construction and extensive resurfacing by contract; small work by force account	Not at present	38c to 40c	38c
Passaic	Straight contract	Sufficient	$3.00 to $3.50	Less than $3
Salem	Straight contract	Yes	$3.50	$2.50
Somerset	.....	Fair amount	$3.75 to $4.00	$1.85 to $2.25
Sussex	Straight contract, and day labor	Sufficient	33 1/3c	25c
New Mexico:				
Luna	By county	Yes	$1.50 to $2.50	$1.00 to $1.25
New York:				
Cayuga	Day labor	Expect to get enough	$2.50 to $4.00	$2.00 to $3.00
Dutchess	Day labor	Fair amount	$2.50 to $3.50	$2.00 to $2.50
Franklin	Day labor	Yes	$3.00	$2.00
Herkimer	Straight contract	No	$4.00	$1.75
Niagara	Day labor, if plant available, otherwise straight contract	Not now, but in prospect	35c to 40c	25c to 32c
Orleans	.....	No	27½c to 40c	20c to 30c
Saratoga	Straight contract	Fair amount	30c to 40c	20c to 25c
Wayne	Day labor	Sufficient	$3.00 (10 hrs)	25c
Yates	Day labor	No	30c	20c
North Carolina:		No	$2.50 to $3.00	$1.50
Davidson	Contract, county furnishing material	No	$2.50 to $3.00	$1.25 to $1.50
Wayne	Straight contract and county work with prison labor			
North Dakota:				
Divide	Straight contract	Yes	About $3.00	$3.00
Ohio:				
Guernsey	Straight contract	Not now	$3.00	$1.75 & $2.00
Highland	Straight contract	No	$2.50 to $3.00	$1.50 to $2.00
Huron	Straight contract	Fair supply	$3.50	$2.50 to $2.75
Madison	Straight contract	Yes	35c to 37½c	20c to 25c
Meigs	Straight contract	Fair number	$2.50 to $3.50	$2.00 to $3.00
Muskingum	Straight contract	Yes	$3.00 to $3.50	$3.00 to $3.50
Wood	Straight contract	Yes	40c	30c
Oklahoma:				
Bryan	Cost plus	Limited amount	$2.50 to $3.00	$2.00
Craig	Straight contract	No	50c	25c
Garfield	Contract; or contract, county furnishing materials	Sufficient	45c to 50c	30c to 35c
Harper	Straight contract	Except in harvest time	$3.00 and up	$2.00
Kingfisher	Straight contract or day labor	No	40c to 50c	25c to 35c
Major	Contract, county furnishing material	Not too many	30c to 45c on bridge work	20c to 35c on bridge work
McClain	Straight contract	Yes	$3.00	$2.00
Pennsylvania:				
Lebanon	.....	Very much so	2.75 (10 hrs)	$2.25 (10 hrs)
South Carolina:				
Florence	.....	No	$1.50 to $2.00	$1.00 to $1.50
South Dakota:				
Deuel	Straight contract	Fair	$4.00	$2.75 to $3.00
Tennessee:				
Greene	Straight contract	Sufficient	$1.50 to $3.00	$1.25 to $2.50
Haywood	.....	Yes	$2.00 to $3.00	$1.00
Lewis	Day labor	No	$2.50 to $3.25 (10 hrs.)	$1.25 to $1.50
White	Day labor	Yes	Average $2.00	$1.50
Texas:				
Castro	Contract; but work done by day labor	No	$3.00	$1.50 to $2.00
Dallas	Straight contract, except for cement and asphalt	Moderate supply	$2.50 to $3.00	$1.75
Frio	.....	Yes	$1.50 to $3.00	$0.75 to $1.50
Lubbock	.....	Yes	$3.00 to $4.00	$3.00
Taylor	Straight contract	No	$2.50	$1.50
Virginia:				
Greensville	Day labor at present	Yes	$2.00 to $3.00	$1.00 to $1.50
Washington				
Clarke	Straight contract on unit prices	Moderate supply	$3.50 to $4.00	$4.00 to $4.50
Columbia	Straight contract	No	$3.00 to $5.00	....
Kittitas	Straight contract for difficult work; day labor otherwise	Yes	$3.50	$2.25
Lincoln	Straight contract	Yes	$3.50 to $4.00 (8 hrs)	$2.75 to $3.00
Pend Oreille	Lump sum contract	Enough	50c	25c
Pierce	Contract	No shortage	$4.00 to $5.00	$2.00 to $3.50
Skamania	Day labor, where there is necessary equipment	No	$3.50	$2.50
Spokane	Lump sum contract	Yes	$4.00	$3.00
West Virginia:				
Fayette	Straight contract	Yes	$30c	20c to 25c
Hancock	Straight contract, county buys brick	No	$3.60 to $4.00	$1.75 to $2.00
Harrison	Straight contract, county furnishing material	Average	$3.50 to $4.00	$2.50
Monongolia	Day labor	Yes	33 1/3c	20c to 25c
Nicholas	.....	Not now	$3.00 to $4.00	$2.00 to $2.50
Raleigh	Straight contract, county furnishing certain materials	Good supply while coal mines closed	30c	20c to 27½c
Webster	Straight contract	No	$3.00	$1.50 to $1.75
Wisconsin:				
Adams	Day labor	No	30c	20c
Forest	.....	Yes	$3.50	$2.00 to $2.25
Grant	Contract on some jobs, day labor on others	Hardly enough	$3.00 (10 hr)	$2.50
Jefferson	Straight contract	No	30c	27½c
Juneau	Day labor	Yes	$3.00	$2.00
Outagamie	Straight contract, county furnishing material.	Sufficient	$3.75 average	$2.50
Sauk	Straight contract and day labor by county	Plenty	30c	25c
Washburn	Day labor at present	Yes	25c to 30c	....
Wyoming:				
Platte	Straight contract with rigid inspection	No	$4.00	$2.50

NATIONAL ROADS

Argument in Their Favor Based on Success of National Administration of French Roads—Necessary for Interstate Routes.

By MAJOR E. A. KINGSLEY, Engr., U. S. A.*

The following appeal for national highways, with its arguments in favor of them based upon French practice and experience, was suggested to the author, we suppose, as being especially timely in view of the agitation for a national system on the part of some good roads advocates and the adoption by the American Road Builders' Association last February of a committee report advocating a national highway system and the establishment of a national highway commission to control the same. The local applications at the end of the article bring the arguments right home to the U. S. A.

In the early days of America, before the railroads or steamboats and long years before the automobile, the government undertook the building of national roads. Roads were necessary for the development of the new country and roads were planned to be built with government funds, by the government and for the people. The people could not build the through roads planned because of the expense. There were but few people to share this expense.

The most notable example of government built road was the old National Road from Cumberland, Md,, west to the Mississippi river. This road crossed the heart of the new country through Mayland, what is now West Virginia, Ohio, Indiana and Illinois. But before its completion, railroads came into use and in the national government's anxiety to aid in railroad construction, roads, as a national issue, were entirely forgotten.

Then came to the front the old and oft-abused "Doctrine of States Rights" and the war of 60-65. During the reconstruction period roads were but little thought of. The South had to recover from its terrific loss, and the North was heavily in debt and busy recovering from the drains of war.

The advent of the bicycle in the early nineties did a little toward making for better roads, but the bicycle influence was local only and largely in the vicinity of the cities and the towns. The bicycle craze was well-nigh universal, but it did not create sufficient sentiment to insure either permanent or national roads.

There is no question but that the automobile invention and perfection has done really more to increase the good roads fervor than any other single thing. Many other conditions and circumstances have combined to cause good roads agitation, but the automobile has created long-distance travel and an actual demand for roads that must be met.

Many of the states have gone forward and have adopted a more or less general plan for state roads. Some of these states have made wonderful progress on their state road systems. But the efforts to nationalize the roads have been confined to organizations and societies with no authority to act. All that could be done was to urge the various states, counties and towns to improve the roads systematically. These efforts have resulted in more or less success at times, but have more often resulted in failures.

The United States Government made a big advance toward better roads and in the direction of national roads, when, in 1916, the Federal Aid law was passed. This law was an incentive to the states to create the necessary road laws to obtain their portion of the appropriation for new roads. And it wisely required government supervision, insuring a more or less uniform method of construction. It was a tendency toward centralization and certainly a step in the right direction. It was only a step, however.

To the 2,000,000 men who have been in France and have seen the net work of roads in every community and extending in every direction the question will arise, "How can we in America get such highways?" The soldier who has traveled over the French roads will return to his farm or his town to cry for roads. He will not be content to drive through the mud, for he has seen what can be saved in time and money by having good roads.

Not only is the returning soldier going to want roads for himself. He will go home demanding great arteries of travel such as he has seen in France. They have shown him that France has prospered and profited by them in times of peace and that France was saved by them in times of war. He knows only too well that many many days and weeks while he was at the front the railroads could not feed him. Trucks by the thousands carried provisions to him because they could reach him in no other way. Without these roads how often would he have been hungry!

In some states a system of through highways can be built, but in many of our states this system must be a makeshift or not built at all. Most of our southern and western states could not entertain the thought of expense of building permanent roads across the state. The expense would be far greater than the state could bear. Then, too, the question of politics and jealousies would enter into the location and each state would look to its own (supposed) advantage regardless of the adjoining state. The result would be, as we now see it, a system of state roads built for the benefit of the state and its citizens only.

In its government, France is more nearly like one of our states than our nation, and the smaller political divisions, termed departments, are somewhat similar to county governments. The roads, too, are divided into two general classes, termed by the French respectively as "routes national" and "routes vicinal."

The latter class, "routes vicinal," are strictly departmental. They are again divided into several classes, but they are built at the expense of the department and so maintained. Each department has its chief of the road service, the "agent voyer en chef." He reports to the ministry of the interior and operates as a departmental officer. The roads are laid out and built as local roads, with reference to the local of the community. No attention is paid to securing short distances through, for they are not through roads. The three classes are well built and well maintained, but they are built and maintained entirely for the community. They are the real market roads. These are the roads over which the peasant woman carries her geese, her butter and her eggs to the market. And these are the roads over which the wood for fuel and the wine, the French staff of life, are carted.

The "routes national," as the name implies, are the state or national roads. They are built by the state (government of France), and they are maintained by the state. They are selected routes between two points often passing through many departments. No attention is paid to departmental lines in laying out the "routes national." Only the question of service to the greatest number of people or benefit to the state is thought of.

*Superintendent of Roads, Intermediate Section (East), A. E. F., France. Major Kingsley has been Superintendent of Roads at Nevers, France, since January, 1918, having charge of the maintenance of nearly 500 miles of the main lines of communication for the American Army in France and the construction and maintenance of nearly as much road mileage in addition on projects and to and from various centers of American Army industries.

The chief of the service of the "routes national" is in Paris, and reports to the Minister of Public Works. In each department of France he has an engineer chief, the "engineer des ponts et chaussees," who has direct charge of construction and maintenance. All of the "roads national" within the limits of his department come under the supervision of this "engineer des ponts et chaussees."

Often times, to shorten the distance of the road, these routes national pass within a few kilometres of good-sized towns and villages, but do not deviate from the "straight" path. The towns will be connected with the route national by departmental roads. As an illustration, Etang, a good sized and important town, is 4 kilometres from route N. 73, connecting therewith by means of G. C. 61. N. 73 is the national road to Northeast France from Moulins. Only a few miles additional would have taken it to Etang. Also, the very important city and famous watering place, Vichy, is but 26 kilometres off of N. 7. But N. 7 is the great highway from Paris south through Nevers, Moulins and Lyon to Southeast France, and, as to pass through Vichy would have lengthened the line considerably, Vichy is served from N. 7 by departmental roads.

The routes national are built under the direct supervision of the engineer des ponts et chaussees. The specifications are furnished from the office of the chief of the service, the "chef due service des routes," in Paris. And the construction methods are the same for all. It matters not whether the roads pass through the rich Burgundy country in the department Cote d'Or, down the valley of the Saone in the department Saone et Loire, through the rich valley of Rhone, or through the rough and poor mountain districts. It is a national route to connect two distant points, and the road construction is uniform. The maintenance is as carefully looked after in one section as in another, whether the section is a rich or a poor one.

The line in France from Tours, a city of about 100,000, to Dijon, a city only slightly smaller, is but a few miles shorter than from Dallas to San Antonio, Texas, cities nearly the same size. The French cities are connected (or were before American truck traffic wore out the macadam) by a splendid national highway. The width, the contour, the surface and all were the same through the various departments.

Connecting Dallas and San Antonio is also a highway. At least there is a highway located between the two cities. It starts from a paved thoroughfare in Dallas and is gravel, macadam, bituminous construction, and even a dirt road, depending upon the section through which you travel, before reaching San Antonio. In summer it is very dusty and in wet weather is impassible in spots. It is not a "route national." The road for a few miles passes through the corner of a certain county, but through no town in that county, and because it was of no direct benefit to the county seat, but of more direct benefit to the next county, the commissioners refused to bear any part of the cost of even grading and graveling the short stretch.

This is but one example. Thousands exist in other sections. Millions of dollars is annually paid as a tax to such a fallacy in light loads and broken vehicles. Even government aid has failed to stop it. True, more roads and better roads are being built and state supervision and construction are being encouraged, but it does not go far enough.

Wyoming can hardly afford to build a great paved highway through the state connecting Salt Lake City and Minneapolis. Colorado and New Mexico would be too reavily taxed to connect, with a permanent pavement, Denver and El Paso, and, besides, El Paso is in Texas. The legislators of Louisiana, Mississippi, Alabama and Georgia who voted money for a permanently paved road from New Orleans to Atlanta would escape hanging by only an inch.

Such roads are rightly national roads. They are for the benefit of all the people. New York and San Francisco are interested. And more than all is the nation interested. Military movements require good roads, for the present-day army is motorized. Everything moves by motor power. Without the motor the modern army cannot exist. All the people must contribute to the cost of national roads, and all the country will benefit by the national system. State and national aid is good and should continue, but a system of paved national roads built and maintained by the government as are the roads of France is the present need and the immediate and urgent need of the United States.

DEVELOPMENTS IN BRICK PAVING.†

Construction with Sand Cushions, Cement Mortar Beds, and Green Concrete Foundation.

By MAJOR WM. M. ACHESON.*

Brick pavement construction since 1915 has been subject to far greater changes in design than any other pavement. These changes, through a more rational use of the same amount of material, have tended to greater strength and durability. In this paper it is the intention to describe the three different types of pavement or I might say the old and the new methods, and point out the advantages and disadvantages of each.

FOUNDATION COURSE.

The foundation course is usually made of cement concrete and in general a 1-2½-5 or 1-3-6 mixture is specified, the thickness depending largely upon the character of the subsoil and the amount of the traffic. While the cement-concrete foundation predominates in brick pavement construction, many miles have been laid on foundations of compact sand, gravel and broken stone. Engineers will agree with me in the absolute necessity and economy of concrete as a foundation for brick and all types of block wearing surface, together with mixed types of bituminous pavements. In fact, to my mind, the time is here when highway engineers are called upon to design rigid types of construction to meet the demand of modern traffic, which means the development of heavy motor-driven traffic.

Engineers are now giving special attention to the different parts of a pavement in order to meet existing conditions. Metal reinforcement is sometimes specified to be imbedded in the concrete foundation over soft places and recently dug trenches. By this it is hoped to prevent the cracking which, in the majority of cases, comes from the condition of the subsoil acting through the base upon the surface of the pavement. Experience has shown that an evenly built foundation which conforms to the finished cross-section of the road will result in a uniform thickness of sand cushion and a smooth wearing surface. In this pavement, as in all other pavements, the key to the whole situation is the condition of the subsoil and the foundation, and in this phase too great care cannot be exercised from the design or construction standpoint.

SAND CUSHION.

Brick pavements with a sand cushion or a bed course of plain sand have been built since the first brick pavement constructed in 1870, and represent at the present time by far the larger percentage of the three types. The thickness of the sand cushion called for in the older

*Division Engineer, State of New York.
†Paper before America Road Builders' Association.

specifications in constructing this type of pavement has been considerably greater than is advocated by most engineers at the present time. The theory advanced in behalf of the sand cushion is that it serves the double purpose of providing a uniform bearing for the wearing surface and supplies resiliency under traffic. With this in mind, specifications called for a sand bed not less than two inches in thickness.

Many of these cushions were not given the proper care in constructing and were formed by screeding out the full thickness at one time without the necessary consolidation by hand rolling. This was responsible for failures in the brick wearing surface which engineers traced directly to the non-uniformity of the sand bed. An effort was made to correct this in later specifications by calling for a sand cushion of not over one inch in thickness, together with requirements as to its gradation by sieve analysis and the amount of loam permissible in the sand used.

New York State specifications for the bed sand required a sand of which 100 per cent passes a No. 6 sieve and not over 90 per cent through a No. 20 sieve. "An excessively fine sand will not be accepted in this class. Sand may be rejected if it contains more than 15 per cent of loam and silt," which amount was deemed advisable for proper compacting.

Present day specifications describe carefully the manner of forming or building up the sand bed by screeding it in layers and rolling the same in order to form as nearly as possible a uniform bearing for the wearing surface.

Notwithstanding all the precautions and refinements of the later specifications where a sand bed is used, it has been shown that the defects are not overcome in the wearing surface, because it is impossible to properly compact a sand bed varying in moisture content and thickness. Also, a wet sand cushion when dried out will shrink and leave hollow spaces, consequently defeating its function of providing a firm and uniform bearing at all times for the wearing surface. Another defect of the sand cushion is that it works up into the joints of the brick and prevents the joint filler from thoroughly penetrating and properly bonding the wearing surface. In the repairing of many of our brick roads I have seen defects in the surface caused by the sand cushion coming up into the pavement at least 2½ inches.

WEARING SURFACE.

The wearing surface of the pavement is composed of vitrified paving brick joined together with a filler. Smaller bricks were used in the early manufacture for brick pavements and without lugs. Later, in order to obtain a unifom width of joint to take the filler, the bricks were made with lugs by repressing. The standard paving brick of today is 3½ inches in length by 4 inches in depth, laying 40 brick to the square yard. These brick are larger than the first brick manufactured.

The wire-cut lug brick came into vogue in 1910, the first wire-cut lug bricks being used by the New York State Commission of Highways in the construction of the Williamsville road near Buffalo. These brick have steadily increased in favor with paving engineers and are now universally called for. The experience of New York State with the wire-cut lug brick has been that it possesses uniform lugs and fiber sides, due to the method of manufacture. The fiber sides which are always obtained in a wire-cut brick give a greater bond strength at all times, while the uniform lugs insure a thorough and even penetration of the filler, and from a construction standpoint provide parallel joints, which means better construction. The square edge of a wire-cut brick in addition means a flush joint, which produces at all times a smooth wearing surface and one which will not cobble under traffic.

Two classes of joint filler are used to bond the brick units together, the cement grout filler and the bituminous filler. My experience and observation are that the results from the cement grout filler are superior and more durable than those from the soft filler and one which is absolutely necessary in the modern semi-monolithic and monolithic types of construction. If soft filler is used, the old sand bed is more likely to be the design. New York State specifications for cement grout filler allow the use of grout made of one part cement and two parts of grout-sand if machine mixed, and a grout made of one part Portland cement and one part grout-sand, if hand mixed. In general, the specifications of today call for a grout made of one part cement to one and one-half parts of sand. Machine-mixed grout is, in the opinion of most paving engineers of today, far superior to hand-mixed and at the same time is more economical in manipulating. Paving engineers recognize the necessity and importance of the grout filler and are taking every precaution in the selection of the materials and their application.

BRICK PAVEMENTS WITH CEMENT-SAND BEDS.

Experience and observation have demonstrated that many failures in the wearing surface are due to the sand cushion, which engineers have endeavored to combat. The solution of this factor has been the development of the cement-sand bed, which provides a non-shrinking, rigid super-foundation, thus making the first step toward a brick monolithic type of construction. Brick pavements constructed with a cement-sand bed are commonly known as semi-monolithic construction, and from this type developed the true brick monothlic construction which is now being used by highway engineers. The semi-monolithic type is the same as other brick pavements constructed with sand cushions, except that a mixture of sand and cement, containing generally one part Portland cement to three parts sand, is substituted for the sand cushion. It is the practice to thoroughly mix these materials dry by machine in the proportions specified. The mixture, when spread out, should be screeded with a template cut to the required contour of the finished pavement. Care should be taken to get uniformity, but hand rolling is not deemed advisable as it has been learned that a rolled cement bed does not insure a smooth wearing surface due to its great density. With an unrolled surface the brick as laid is always bedded in the cement-sand super-foundation. The thickness advocated in general is a minimum of ¾ inch and a maximum of 1 inch. It is my practice to wet the cement-sand bed with a sprinkling can just ahead of laying the brick. Immediately preceding the grouting, the brick surface should be thoroughly wet. All precautions should be taken in the mixing and the application of the grout filler.

With present methods, the semi-monolithic type of construction is better adapted to wide street construction than the monolithic.

The advantages of semi-monolithic construction are that it overcomes the defects of the sand cushion by insuring rigid construction in that it practically unites the wearing surface with the concrete foundation. The cement-sand cushion at all times provides a perfect bond for the full depth of the brick. This type eliminates the shrinking which is common in a sand cushion and at the same time eliminates the hollow crumbling noise

which is common with the sand cushion type of construction. It gives a more economic and scientific design in that it provides a stronger slab with the same material.

Brick pavements with cement-sand beds were built in Baltimore as early as 1906 and adopted as their type of construction in 1915. The cement-sand bed was used in Jacksonville in 1910 and also in connection with the paving of the ramps of the Pennsylvania Railroad terminal in New York in 1910. It has been demonstrated here that shallow vitrified brick will stand up under heavy truck conditions when laid upon a cement-sand bed. In this case fire clay brick 2¼ inches in depth were used. This work in the Pennsylvania terminal demonstrates that in many places a block of less depth than the standard block can be economically used; in fact, in the city of Syracuse an experiment was made by which a 3½-inch block was laid on a cement-sand cushion with railroad tracks in the center on a street entering the city and satisfactory results have been obtained, and I have in mind that in the next pavement of this kind that we lay a three-inch brick will be specified.

BRICK PAVEMENTS WITH GREEN CONCRETE FOUNDATIONS.

This type of construction is commonly known as the monolithic type and is better adapted for highway construction up to, say, 24 feet in width or where a template may be used to shape the entire width of road at one time. It was first used in highway construction near Paris, Illinois. Proper consistency of the concrete foundation is essential for this type of construction. Care should be used in the proper spading and distributing of the concrete to prevent waves in the finished pavement due to possible difference in density. The concrete foundation is spread usually ½ inch high and formed by using a tamping template which brings to the top a smooth mortar surface on which to bed the brick.

For this purpose there has been developed a mechanical templet which consists of a gasoline engine mounted on a cross frame with wheels, which is carried on the side forms. This power templet performs the double purpose of tamping and smoothing the concrete, and in addition compresses it to better density. This templet moves at the rate of 4 feet a minute and can be adjusted to different widths. The laying of the brick wearing surface should follow closely on the concrete foundation and the bricks should be inspected, culled and rolled before the cement has taken its initial set. For rolling the wearing surface, a hand roller is advocated about 30 inches long, 24 inches in diameter, weighing from 600 to 900 pounds. The rolling should follow immediately after the inspection, so that the grout filler may be applied at once to secure the necessary bond with the concrete foundation.

In this connection the so-called wire-cut lug brick is of special value in that it develops the full strength of the slab by reason of its superior side bond, due to its fiber sides, and assures penetration of the bonding material to all parts of the joints due to its uniform lugs.

The mixing and placing of the grout filler is of the utmost importance for this type of construction, as in the construction of brick pavements of the other types, and the same precautions must be taken in the selection of the materials and their application.

All the advantages claimed for the semi-monolithic type of construction will hold for the brick pavements constructed on green foundations, to which may be added the increase of slab strength due to the more perfect bond of the wearing surface and the concrete foundation. This type also eliminates the use of edges in highway construction. which reduces the cost. The use of the semi-monolithic and monolithic types have tended to develop the use of paving brick of less thickness, which will result in economies, one of the most important being the saving in transportation charges. There should also be an economy in the first cost together with a saving in actual manipulation.

In my opinion the day of the sand cushion on rigid foundation is ended and the satisfactory type is a cement-sand cushion for village and city streets, while brick pavements for highways should be constructed on a green concrete foundation.

In closing I wish to emphasize the paramount importance of proper design of highways to take care of modern traffic. To my mind a rigid foundation is absolutely necessary on main trunk lines and where truck traffic predominates or may develop in the near future. The use of motor trucks for commercial purposes has grown tremendously and it is our duty to design highways which will be able to stand their loads up to reasonable limits and with reasonable maintenance charges.

FINANCING HIGHWAY IMPROVEMENTS*

Life of a Loan Should Be That of the Road—Payment by Annual Appropriations—Parties Interested in Road Financing.

The subject of "Methods of Financing Highway Improvements for States, Counties and Townships" has been frequently discussed in papers presented at meetings of this association and in the technical press.

Your committee appointed to consider this subject will present what it believes to be some fundamental principles which should control the policy to be followed in the raising of funds for highway improvement, especially where these funds are raised by loans. Consideration will be given only to road systems outside of populous centers, in which latter the property values are large and the policy of assessment for benefit quite generally prevails. It will deal, therefore, with the method of raising funds where the cost of the improvement is to be a general charge.

J. E. Pennybacker, chief of management of the Bureau of Public Roads of the U. S. Department of Agriculture and who is also a member of this committee, has prepared a memorandum of the methods which have been used in financing highway improvements, which covers the ground very fully, which memorandum the committee submits herewith and makes it a part of its report.

It is very desirable that a complete system of roads should be developed as quickly as possible in order that the public may have the benefit of it. If the project is one which can be entirely carried out in, say, five or six years, the raising of funds by direct taxation through annual appropriations would involve an undue burden and the logical way to provide them is by a loan, but this loan should be for a period no greater than the probable average life of the improvement. Part of the work may be of a permanent character, such as the improvement of lines and grades; part may have an estimated life of thirty or even fifty years, such as bridges, culverts and tree planting; while the road surface may not last more than ten or fifteen years. There may be

*Report of Committee on "Methods of Financing Highway Improvements for States, Counties and Townships" of the American Road Builders' Association, Nelson P. Lewis, chairman, presented at the sixteenth annual convention.

a term of years which may be said to correspond with the average life of the entire improvement and this should be the limit of the term of the loan. Whether all of the bonds should run for the same length of time and a sinking fund established to care for them at maturity or whether they should be serial bonds—and both plans have their advocates—the debt should be paid within the estimated average life of the improvement taken as a whole.

If, however, the project involves a state-wide improvement which could not be completely carried out in twenty years or more, it would be cheaper in the end to provide for it by annual appropriations, the burden of which would be no greater than would the interest and the sinking fund payments on long-term or fifty-year bonds. This plan involves one serious difficulty in that the completion of the project will depend upon the caprice of the law-making and appropriating body. With a bond issue authorized and the bonds sold, there is no question as to the funds and the work can be organized and carried out in an orderly and efficient manner. To create an organization to perform the work and to get it well under way in the expectation that the necessary annual appropriations will be made, and then to have them stopped as a result of financial stringencies, or a change in the complexion of the appropriating body and a desire on its part to investigate what the party formerly in control had done, would be disastrous.

In order to avoid such a contingency, it will probably be better, even in the case of road improvements which would require a number of years to carry out, to resort to the issue of bonds so arranged with respect to maturity that the tax burden to provide for their liquidation would correspond quite closely with an annual appropriation covering what might reasonably be considered the life of the improvement. Such methods have been quite frequently adopted or proposed during recent years, an excellent example being that suggested by the financing of the $60,000,000 road improvement scheme in Illinois. This Illinois plan appears to contemplate caring for the bonds, as to both principle and interest, from receipts for the licensing of motor cars. Such use of these bonds may be justified, but this source of revenue should be devoted first to maintenance and only the surplusage over these requirements should be used to liquidate a debt incurred for construction.

Your committee will not multiply examples, but will urge upon those responsible for the planning and financing of future highway improvements, especially those the cost of which is to be met by loans and the magnitude of which will be very great, the necessity of the adoption of such sound methods of financing as will commend themselves to all of the following parties in interest:

The taxpayer, who wants value received for the funds which the town, county or state takes from him and does not wish to keep on paying for something which is worn out and forgotten;

The contractor, who wants the work of highway improvement to go on in an orderly fashion and in such a way that the public authorities will not be obliged to stop this kind of work until popular discontent at the manner of financing which may have been adopted has had time to blow over;

The town, county or state, which desires to preserve its credit and find a ready market for its obligations when issued;

The investing public, which likes to feel that funds available for investment can be safely loaned to the government which stands in the most intimate relation to them; and to

The politician, who is always ambitious to acquire a reputation for shrewdness and sound judgment in his conduct of the public business.

HAY-TAR ROADS IN WISCONSIN.

Some months ago Municipal Journal described an experiment being made by the Wisconsin Highway Commission, consisting of the application of hay and tar to roads in deep sand in a section of country where other materials were not available. In part of the experimental road, marsh hay and tar were used, while on the balance marsh hay or rye straw was used covered with a thin layer of sand.

After twelve months of service, the State Highway Commission reported that the untreated hay had been destroyed, largely by rotting. Untreated hay with sand on it enabled the treated layer to be placed much more uniformly and without the formation of ruts, but the first layer of hay was not of lasting benefit. However, it was demonstrated that the mere adding of sand to an untreated application of hay or straw increased its life greatly. In a number of sections of that state, and elsewhere, roads have been treated by merely placing hay upon them, whereas their life could be easily doubled by placing sand on top of the hay.

It was apparent that the method of employing the tar was not satisfactory, since running the oil-spreading wagon over the layer of hay formed ruts in the sand beneath, which could not be removed. If this type of road is to be constructed, some better method of distributing the tar should be devised. (We suggest a caterpillar truck for distributing the tar.) If such a road is to be maintained through a series of years, less hay and tar can be used during the second and following years than on the first application.

The commission was surprised to find that the rye straw proved as satisfactory as the hay, but this was apparently the case.

The cost of the experimental road was $701 for 4,977 square yards which were treated with tar to the extent of from a half-gallon to a little over a gallon per square yard, and 1,900 square yards which did not receive any tar treatment.

The commission does not recommend this type of road where it is possible to obtain local clay or gravel. At the present time a mile of nine-foot road treated in the best manner above described would cost about $1,000 and higher. This might be justifiable if no other material can be obtained, but the commission feels that the same money could be used more economically in placing clay or gravel if this material were available within a distance of several miles. Also it probably would not prove at all satisfactory for roads carrying any considerable amount of heavy truck or wagon traffic.

A HAY-TAR ROAD IN THE MAKING.
Tar distributor has just passed.

The WEEK'S NEWS

Reorganization of U. S. Defense Council's Highway Transport Committee—California's Highway Developments—Indianapolis Begins Work on $2,000,000 Sewage Plant—Suppressing Drug Traffic in New York City—Auburn, N. Y., Increases Water Rates—Eight-Hour Day for Ft. Wayne Police—Ranger, Oil Town, Swept by Fire—Court Declares Municipal Ice-Making Unconstitutional—Los Angeles to Sell Municipal Cement Mill.

ROADS AND PAVEMENTS

May Reimburse War-Hit Contractors.

Albany, N. Y.—The sum of $3,500,000 would be appropriated to reimburse highway contractors who abandoned their contracts because of the high war cost of labor, materials and transportation under the terms of a bill introduced by senator Knight. The measure would give contractors who abandoned work in 1917, not to exceed 35 per cent. above the original contract price and those who abandoned their contracts in 1918 not more than 45 per cent. The final determination of the awards is to be left to the Court of Claims. The contractors would be permitted to receive the percentage of excess upon their stipulation that the amounts represented no profit to them.

Highways Transport Committee Reorganized.

Washington, D. C.—Grosvenor B. Clarkson, director of the U. S. Council of National Defense, announces a reorganization of the council's Highways Transport Committee. In harmony with the council's reorganization to a peace-time basis, the work of the Highways Transport Committee has been broadened to include direct representation from the office of Public Roads and Rural Engineering of the Department of Agriculture; the Bureau of Markets of the same department; the Postoffice Department and the Department of Commerce. With this reorganization close co-operation with the executive departments most vitally interested in matters of highways transportation will be brought about in such a way that the committee will be clearing house of action for all federal interests concerned. The committee as reorganized consists of the following: John S. Cravens, of the Council of National Defense, chairman; James I. Blakslee, fourth assistant Postmaster General; J. M. Goodell, consulting engineer, office of Public Roads and Rural Engineering; James H. Collins, investigator in market survey, Bureau of Markets; R. S. MacElwee, second assistant chief, Bureau Foreign and Domestic Commerce; Charles W. Reid, executive secretary, and Grosvenor B. Clarkson, director of the council, ex-officio. The committee will be assisted by the Highways Transport Committee Advisory Board consisting of: William Phelps Eno, of Washington, D. C.; Prof. Arthur H. Blanchard, of New York; C. A. Musselman, of Philadelphia; Raymond Beck, of Akron, Ohio, and John T. Stockton, of Chicago. The council in addressing itself particularly to the problems growing out of the entrance of the motor truck into the commercial transportation field, will seek to determine just how the motor truck can best be fitted into the nation's existing transportation agencies. It is the policy of the council, through its committee, to co-operate with all transportation agencies with the view of determining for the people how their transportation needs can be served most efficiently, speedily and economically, and to aid in the promotion of motor express lines through rural communities which now do not have adequate transportation. The council will co-operate with the United States Railroad Administration in the study of the short haul problem, and will also give specialized attention to the relation of the rural motor express to interurban electric lines and waterways traffic in the interest of all elements concerned. John S. Cravens, who heads the committee, is from California, and is a banker and electric power developer of wide experience and high standing, who has served with the council for nearly two years. The eleven regional directors of the Highways Transport Committee are leading business men in their respective localities, and distinctly represent general business rather than any form of transportation interests.

Highway Progress in California.

Sacramento, Cal.—At the end of the fiscal year last July there were 2,300 miles of highway in California under state maintenance, according to the first biennial report of the state highway commission just issued. The estimated cost of seven proposed laterals is given as $9,000,000, of which the counties' share would be about $6,000,000. Some of the counties, it was stated, cannot afford the amount to be assessed against them, and the report gives, as the view of the commission, that it "sees no reason why the roads should not be constructed and paid for by the state as are other roads in the system. In general they are of much greater importance to the state at large than are some of the laterals in county seats provided for in the first State Highway Act, providing for work for which $18,000,000 in bonds was issued." For the biennial period ending June 30, 1918, there were built 1,617.14 miles of state highway. These figures do not include contracts concluded but not yet accepted, aggregating 349.37 miles. During the war period, the report says, highway work dragged, and the cost was increased from 40 to 60 per cent. over the estimates for 1915. The result was that contractors lost money, and it is recommended in the report that these losses should be the subject of special consideration. A bill is now before the Legislature authorizing the commission to reimburse these losses. Of the second issue of bonds there remains unsold approximately $7,884,000 worth, of which $3,000,000 must be reserved for the construction of laterals, and obligations already incurred will require at least $2,750,000 for their fulfillment, so that little more than $3,000,000 remains for new work. Untoward conditions due to the world war upset the expectations of the commission to complete the state highway system with the proceeds of the second bond issue of $15,000,000. No recommendation was made by the commission as to the proposed new bond issue, but it was declared that the "commission is faced with the only other alternative of securing the greatest value attainable with the funds at its command." The report contains a recommendation that a state motor police be established to stop the abuse of state highways by heavily loaded trucks and other agencies. It is suggested that the police be limited in number and authority and be under the jurisdiction of the motor vehicle department.

SEWERAGE AND SANITATION

Begin Work on $2,000,000 Sewage Plant.

Indianapolis, Ind.—The board of sanitary commissioners, which will build the $2,000,000 sewage disposal plant for the city of Indianapolis, has employed Charles H. Hurd, consulting engineer, as supervising engineer of construction. The work, it is estimated, will require from two to three years to complete. Mr. Hurd, who resigned recently from the board of sanitary commissioners, having been ap-

pointed in 1917 after the legislature had passed the law providing for the sanitary board and the erection of the sewage disposal plant, will receive a salary of $15,000 a year. The board adopted a resolution that all appointments of employes provided for in the contract with Mr. Hurd shall be made by the board on recommendation of Mr. Hurd, the board reserving the right to reject any nomination. The board also reserved the right to dismiss any employe, for cause, on its own motion. Under Mr. Hurd's contract, he will prepare the designs for the plant, supervise construction, prepare bids for submission to the board by contractors and when received tabulate them for the board and keep the board advised daily as to the progress of the work. The sanitary commission, composed of Frank C. Lingenfelter, president; Lucius B. Swift, vice-president, and Jay A. Craven, secretary, decided, after getting tentative proposals from engineering firms qualified to handle the project, that it would be much more economical and more advantageous for the city to have a supervising engineer who would be on the job practically constantly. Proposals were obtained from two of the leading engineering firms of the east, and the fees asked for the preparation of detailed plans and supervision of the construction work through resident engineers averaged approximately $130,000. If the engineering work had been taken over by an engineering firm such as those which submitted proposals, the commission points out, the construction work would have had to be taken over by a general contractor whose fee would range from 8 to 10 per cent of the contract price, or from $160,000 to $200,000. Under the plan adopted by the board the construction work will be supervised by Mr. Hurd, and the board and the general contractor's fee will be saved. The board will employ and pay necessary assistant engineers. The construction of the huge intercepter, which will carry the city's sewage from the sewers to the sewage disposal plant, which will be built on city property southwest of the city, will be begun first and the board is obtaining the right of way for the intercepter.

City Opens Clinic for Drug Addicts.

New York, N. Y.—Following extensive raids against druggists and physicians who have been illegally writing and filling prescriptions for narcotics, the city health and police officials were besieged by requests for the drugs from addicts and a clinic has had to be opened for them. Using the broad powers conferred by the Harrison anti-narcotic law for the first time, the federal government struck heavily at the drug traffic, arresting six physicians and four druggists and herding more than 200 addicts, shaking, quivering, physical wrecks, not one of them more than thirty years old, into police headquarters. The raids came suddenly and were worked out and directed by Major Daniel L. Porter, supervising internal revenue agent for this district. The decision to attack the drug traffic in this city was reached some months ago, after many reports had gone to Washington indicating a steady increase in the illicit use of cocaine, heroin, morphine and other narcotic poisons; reports which were supported by the recent utterances of health commissioner Copeland warning that drugs were fast becoming a menace to the city. Although prepared to go ahead with the campaign, the agents of the bureau of internal revenue, going on their assumption that the mainstays of the traffic were unscrupulous physicians, were unable to take action because of the legal protections enjoyed by the profession. In the latter part of February, however, the United States Supreme Court rendered a decision which interpreted the Harrison law so as to give the enforcing officers almost limitless authority. Major Porter worked for some weeks at Washington, and then with a strong force of special agents—men from all professions and trades from lawyers and physicians to steamfitters and clerks—came to New York and made the raid after secret investigations. The agents in their two months' investigation in this city established that in the last year 1,500,000 prescriptions for the illicit procuring of narcotics had been issued and filled. It was also ascertained that the federal authorities have evidence that thirty physicians are in a sort of "drug ring" issuing prescriptions for narcotics for fees ranging from 25 cents to $4. The principal drug being dispensed in this city, according to the investigations of the federal agents, is heroin, a derivative of opium, and one of the most destructve narcotic poisons. This drug is obtained through the regular channels at $12 to $15 an ounce and is retailed through the prescriptions at $60 to $75 an ounce. The unscrupulous physicians writing the prescriptions are each issuing as many as 200 a day, the agents are prepared to prove, most of the doctors having no other practice. The investigations of the government in New York have disclosed that 70 per cent. of the drug addicts are less than twenty-five years old, and that included in the victims are a remarkably high percentage of discharged soldiers and sailors. Sixty or more drug addicts visited the drug addiction clinic the first day it was opened by the department of health, and during the day about seventy-five addicts applied for relief at the community clearing house for addicts. They were all sent to special wards in four hospitals. Hundreds came the second day.

WATER SUPPLY

To Protect Mains from Electrolysis.

Evansville, Ind.—An arrangement which will save the city hundreds of dollars has been made by the water works board in entering into an agreement with the Public Utilities company to eliminate electrolytic action which is injuring the water mains of the city. The board adopted the report of E. E. Brownell, of Philadelphia, consulting electrical engineer, who had made a survey of the electrolytic condition of the water service. The Public Utilities company already had agreed to carry out the recommendations in Mr. Brownell's report. A contract is to be signed by which the Public Utilities company will install a mitigating system by Nov. 1 and Mr. Brownell will make an inspection of it at that time. This system, which will be installed entirely at the expense of the Public Utilities company, under the direction of the joint engineer, will be a system of wires and cables which will hold the current which is now escaping through the ground and destroying the water mains, as well as the Public Utilities company's gas mains. In consideration of this action by the company, the city will waive all claims to damages to pipes. The new system will make certain that no damage will be done hereafter to the pipes, although, of course, pipes that have been damaged prior to its installation will still be liable to break under too much pressure. Mr. Brownell, who will have practically the status of an official of the city, will oversee the operation of the system and will inspect it at least once a year.

Water Rates Increased.

Auburn, N. Y.—The water board has adopted a new schedule of rates that amounts to an increase of approximately 30 per cent over the present flat rates and 15 per cent over the present metered rates. The high level of prices for labor and materials is the cause. The annual report of the board says: "As a large part of the expense for pumping water is the cost of coal it is interesting to note what the amounts have been for the past four years. They are as follows:

1915	$8,262.80
1916	9,099.26
1917	14,271.07
1918	20,132.08

"The above figures represent the rising cost of coal during the war period, but it does not represent the pumping of any large extra amounts of water, and it represents only the additional cost of coal; and as the cost of coal has gone up the quality of it has deteriorated to such an extent that the cost of it is seen to have increased nearly

250 per cent." The new rates went into effect April 1. Compared with the old ones they are as follows:

Annual Fixture or Flat Rates.

Faucet (or sink use)	$3.40	$2.60
1 water closet	2.60	2.00
Additional closets, each	1.40	1.00
1 bath tub	2.60	2.00
Additional bath, each	1.40	1.00
1 wash basin	.80	.60
Additional basins, each	.60	.40
1 set washtubs or trays	1.80	1.40
Hose use, when held in hands, season	4.20	3.20
Hose use, stationary, entire use in premises, will be metered.		
1 stable, private	4.20	3.20
1 hopper closet	7.80	6.00

(Above net rates are for one family only. A penalty of 10 per cent. will be added if not paid on or before the 20th of the first month in each quarter.)

Monthly Meter Rates per Meter.

Minimum rate, each meter	$0.65
First 1,000 cu. ft. (1)	1.30
Next 2,000 cu. ft. (3 inc.) each	1.00
Next 5,000 cu. ft (8 inc.) each	.80
Next 10,000 cu. ft. (18 inc.) each	.70
Next 20,000 ft. (38 inc.) each	.50
All over 38,000 ft., each	.40

(The above meter rates are net with a penalty of 10 per cent. added if not paid on or before 10th of current month.)

During the last few years operating expenses have increased rapidly, as is shown by the following table:

1915	$60,557.79
1916	67,866.71
1917	73,967.33
1918	82,004.49

FIRE AND POLICE

Eight-Hour Day for Police.

Ft. Wayne, Ind.—An eight-hour day for all city patrolmen has been ratified by the board of safety, the finance committee of the city council, a delegation of members of the police force and a committee from the Federation of Labor. The new eight-hour day will go into effect on October 1, 1919, provided the city council acts favorably on the ordinance, which is soon to be introduced asking for the appropriation of an additional $5,000, which, it is believed, will be sufficient to defray all expenses due to this change for the remainder of 1919. Fifteen new patrolmen will be required. The eight-hour day will only affect the patrolmen, but ways and means are being devised, it is thought, whereby all members of the poilce department will be benefited.

Big Blaze Sweeps Oil Boom Town.

Ranger, Tex.—Almost two square blocks of the business district of Ranger were wiped out by fire with a loss estimated at between $750,000 and $1,000,000. Before the flames had died away, owners of destroyed structures were planning to rebuild. Under provisions of a recently passed city ordinance, only fireproof buildings can be erected in these two blocks, as they are in the fire district—in the very heart of Ranger. Several of the largest restaurants of Ranger were burned to the ground. The district that was destroyed consisted mostly of frame buildings erected quickly to take care of the constantly increasing abnormal population attracted to Ranger by oil. The buildings, some of which had only board walls, burned fast. For a few minutes it looked as if the entire business part of Ranger would be burned to the ground. A change of wind, together with the bucket brigade's fighting, however, prevented the flames from extending farther than they did. Oil drillers, proprietors and employes of the burning establishments, women and children, joined in the bucket brigade fight. Water was scarce, and had it not been for the recent rains the fire fighters would have had an even more difficult task. Nearby tanks had been filled by the heavy rains. There was only one hydrant with running water in the vicinity of the fire. Ranger's bucket brigade, organized before the real oil boom came, was not able to meet the situation. Business men of Ranger had been fearing the fire and realized that if a fire should ever get under way it would wipe out at least a block. They had already started a movement to secure adequate fire fighting apparatus. The need of such equipment was one of the reasons Ranger was recently incorporated. Some of the smaller buildings were dragged from their locations with the hopes of saving them. Chains were tied around them and they were pulled aside by auto trucks only to be eaten up by the flames a few minutes later. Nearly all Ranger began to move when the fire started to spread. Thinly clad guests left their hotels and rooming houses. Fixtures were dismantled and placed in the street. A few home owners near the business districts moved their belongings in wagons to the edge of the town.

To Oust Police and Firemen Who Gave Low Age.

Hoboken, N. J.—Supreme Court Justice Francis J. Swayze has made an absolute rule permitting the Hoboken Chamber of Commerce to go ahead with the quo warranto proceedings to oust twenty-five police and firemen who swore falsely that they were under the thirty-five-year age limit at the time of their appointment. This means that the justice takes no cognizance of the fact that the men have formally resigned from the police and fire departments. The court upholds the contention of Dougal Herr, counsel for the chamber, that the policemen and fire fighters cannot resign from positions that were never lawfully theirs. Action will be taken later upon the application of Mr. Herr to punish them for perjury and misrepresentation. The men in question resigned just before the case began before justice Swayze. Mayor Griffin and the city commissioners will reappoint them after extending the age limit to fifty-five years. City attorney John J. Fallon apparently thought that the suit would be discontinued when he made this announcement. But Mr. Herr proceeded to ask justice Swayze to punish the men for perjury and misrepresentation. This application made it necessary to take all the testimony. Registry books from the county clerk's office were produced to show that the appointees were over thirty-five years of age. At the conclusion of the hearing justice Swayze took the matter under advisement. The justice said he doubted that his powers included the right to punish individuals for perjury in such cases. His immediate opinion was that a man cannot be punished for perjury unless the grand jury has found an indictment for offense.

MISCELLANEOUS

Municipal Ice-Making Unconstitutional.

Kansas City, Mo.—The $400,000 bond issue proposed for the purpose of constructing a municipal ice plant for the city, has been declared unconstitutional by the Supreme Court of the state on the ground that ice-making is a private enterprise and the city cannot engage in private enterprises. The decision was six to one. The dissenting judge held that ice is a prime necessity in cities and its manufacture for the protection of the health of the people is an exercise of the police power. There may be an application for a rehearing.

To Sell Los Angeles Municipal Cement Plant.

Los Angeles, Cal.—The city is now advertising for buyers of its big cement plant, said to be the only municipal portland cement mill ever existing. The Monolith mill was built in 1908 by the city for the manufacture of cement to be used in the large Los Angeles aqueduct project. The plant is situated 117 miles north of Los Angeles, and includes contiguous and almost inexhaustible deposits of clay and limestone. The city was for a time undecided as to its disposition, but has finally determined not to enter into commercial competition in the production of cement and that the mill is much too large for the needs of its own construction. The mill used a volcanic deposit in close proximity to the mill, producing a tufa cement. This blended cement required additions to the mill, so that now it has a capacity for blended cement of about 1,500 barrels.

NEWS OF THE SOCIETIES

April 25-26.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, Logan Hall, West Philadelphia, Pa.

May 6-8.—NATIONAL FIRE PROTECTION ASSOCIATION. Annual convention, Ottawa, Can. Secretary, Franklin H. Wentworth, 87 Milk St., Boston, Mass.

May 12-14.—AMERICAN ASSOCIATION OF ENGINEERS. Annual meeting, Chicago, Ill. Secretary, C. E. Drayer, 29 South LaSalle St., Chicago, Ill.

May 14-15.—LEAGUE OF TEXAS MUNICIPALITIES. Seventh annual convention, Sweetwater, Tex. Secretary-treasurer, Frank M. Stewart, University of Texas, Austin, Tex.

May 19-24.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Atlantic City, N. J. Secretary, T. C. Martin, 29 W. 39th St., New York.

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

June 17-20.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, St. Paul-Minneapolis. Secretary, Charles W. Hunt, 33 W. 39th St., New York, N. Y.

June 23-26. — SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, Coates House, Kansas City, Mo. Secretary, E. L. Fulkerson, 617 Washington St., Waco, Tex.

June 24-27.—AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University.

June 24-27.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

American Society for Testing Materials.

The American Society for Testing Materials will hold its twenty-second annual meeting at Atlantic City, N. J., on June 24-27, with headquarters at the Hotel Traymore. A number of committees will recommend new standards for publication as tentative, and reports will be made on several important investigations which have been conducted by committees. The present membership of the society is 2,372 as compared with 2,261 at the last annual meeting.

The society is participating with other engineering organizations in the work of the American Engineering Standards Committee, which was organized in October, 1918. Two A. S. T M. standards—namely, those for Portland cement and those covering fire tests of materials and construction—have already been adopted by the standards committee as "tentative standards," with a view finally to their adoption as American standards.

On the invitation of the United Engineering Society the American Society for Testing Materials has become a member of the Engineering Council, in which there are now five other member societies, and has designated Albert Ladd Colby, South Bethlehem, Pa., as its representative in the council.

Engineering Council.

The Engineering Council, through its National Service Committee, has sent out invitations to 152 representative engineering societies of the United States, requesting the selection of delegates to attend a national conference on the establishment of a federal department of public works. The conference is to be held in Chicago April 23-25.

With the invitation there has been sent to each society a general plan of organization for the conference and a statement of some of the principal questions which the conference will have to consider. It is requested that the societies take up these questions and, if they so desire, vote upon them prior to the conference.

The calling of this conference follows close on the action of the Engineering Council on February 20, 1919, advocating the establishment by Congress of a department of public works and urging engineers in all branches of the profession to use their influence to arouse public opinion so that the importance to the national welfare of such a department may be understood.

American Water-Works Association, Illinois Section.

The eleventh annual meeting of the Illinois Section of the American Water Works Association was held March 25 and 26 at Urbana. Most of the papers read dealt with technical subjects.

Milton F. Stein described the work of the testing station at Cleveland, Ohio, on water softening. The design of the chemical treatment process as dictated by the experimental work was brought out to indicate that local tests should precede design in most cases.

Several typhoid fever outbreaks in Moline, Ill., have occurred in the past two years. M. C. Sjoblom traced the cause to a bypass valve permitting unfiltered water to enter the clear well at a time when little or no chlorine was being applied.

Lieut. Everett Judson, of the United States Public Health Service, described in detail experiments on adonite, a fermenting sugar, to differentiate B. coli. Opinions expressed in discussion indicated that the test was not yet a safe one.

Crenothrix removal was discussed. After a trial of more than a year the Champaign & Urbana Water Co. still finds the use of 4.6 lb. of chlorine per 1,000,000 gal. is an effective agent in eliminating crenothrix from its ground water-supply, said F. C. Amsbary. W. F. Monfort, in reviewing work done on the problem in conjunction with O. A. Barnes, indicated that chloramine was a better reagent, but that the difficulties of its application and in preserving its stability made the chlorine more desirable so long as it continued to kill the crenothrix.

Minna E. Jewell has been making intensive studies of the Sangamon River, one of the most polluted streams of the state. According to her conclusions, biological tests are more practical than chemical or bacterial in determining the extent to which stream pollution may be permitted without the creation of a nuisance.

Experience with the new large-capacity 36-in. well at the University of Illinois was described by Prof. M. L. Enger. Unlike the smaller wells, its capacity per foot of draw-down has increased in two years from 19.5 to 21.5 gal. per minute. One of the older wells was reduced in 10 years from 7.2 to 4.9 gallons.

Consumption of water at Illinois state institutions varies from 70 to 350 gal. per capita per day, according to F. J. Postel. Meters are installed on the low-consumption systems. There has been wilful waste of water.

L. R. Howson, outlined the unusual well-water supply conditions of Baton Rouge, La., where 2050-ft. wells deliver water at a temperature of 92° F. with a static head of 120 ft.

The Old Hickory Powder Works water-supply was described by O. E. Bulkeley. Ninety-six tub gravity filters with a daily capacity of 65,000,000 gal. were hand-operated. Determination of the rate by noting the drop each hour, and the satisfactory utilization of women as filter attendants, were features of the operation.

The following officers were elected for the coming year: Chairman, W. E. Lautz; vice-chairman, F. C. Amsbary; treasurer, H. E. Keeler; secretary, G. C. Habemeyer, Urbana.

American Association of Engineers.

The Pittsburgh Chapter of the American Association of Engineers now has a full-time secretary. This is the first chapter outside of national headquarters at Chicago to have a secretary giving all of his time to the work of the association. F. E. N. Thatcher has been selected for the position and will have an office at 1312 Fulton building, Pittsburgh.

The Washington Chapter at its meeting elected the following officers: President, Harry Stevens, civil engineer, Union Trust Co. Bldg.; first vice-president, A. Y. Hess, designer, Navy Department; second vice-president, Clegge Thomas, mechanical engineer, Washington Loan and Trust Co. Bldg.; secretary, E. L. Howard, Bureau Yards & Docks, Navy Department; treasurer, O. M. Sutherland, mechanical engineer, Bureau Yards & Docks.

The Kansas City Club of the American Association of Engineers at its recent meeting elected the following officers: Chairman, J. E. Jacoby, consulting engineer, Shukert Bldg.; vice-chairman, W. B. Cast; secretary, R. N. Clark; treasurer, S. M. Bate.

INDUSTRIAL NEWS

Road Handbook.

The Barrett Company, New York, N. Y., has issued a valuable little handbook entitled "Tarvia Road Book." It contains useful tabulated data on highway construction quantities, including the amounts of Tarvia, stone, macadam, gravel, pitch filler or lug wood blocks, bricks, etc., on given road yardages under different conditions; weights of materials per cubic yard; table of ready computation of stone costs in road building; costs per mile at price per square yard; conversion tables of linear feet to miles and degrees F. to degrees C.; gauge of cylindrical tanks, specific gravities, degrees Baume, pounds per gallon and gallons per pound; instructions for applications of steam to B. M. X. tank car coils. There are also given complete specifications for Tarvia-B, Tarvia-A, Tarvia-filled macadam, resurfacing old macadam with Tarvia, Tarvia modern pavement, Tarvia mixed macadam and Tarvia concrete—Topeka mix. There are blank pages for memoranda. The handbook is conveniently and attractively bound in green leather. It is issued free upon application by any highway engineer, contractor or road builder.

"Prosperity Campaign" to Promote Construction.

In an effort to stabilize prices, lower the cost of living and stimulate business reconstruction a "National Prosperity Campaign" under the chairmanship of Philip H. Gadsden, Chairman of the National Public Utilities Committee, has been begun. The object will be to bring business men to the belief that it is within the power of industry to resuscitate itself. A statement issued says:

"That the stabilization of business at present price levels rests within the power of industry itself is the belief of the National Federation of Building Industries, and is the message that is being forwarded to members of the War Service Committees and the Chambers of Commerce of the United States, as well, as by leaders of business, by the National Prosperity Campaign.

"Regardless of Government attitudes toward the present price situation, there is a realization of the necessity for the upkeep of production and the absorption of the unemployed, and the distribution of such propaganda as will stimulate confidence as well as activity in business projects. Several hundred firms throughout the country have wired their approval and co-operation, the sponsors of the movement including Franklin T. Miller of the Department of Labor, John J. Arnold, Julius Rosenwald, Alexander C. Brown, Charles F. Lang, E. T. Trigg, E. P. Albrecht, Joseph E. Davies, Frank A. Sieberling, Cardinal Gibbons, James H. McGraw and others.

"Granting the general retail buying by the ultimate consumer is still enjoying its usual boom even at present prices, the fact remains that industry has been waiting, and is waiting for basic prices to strike a permanent level that would justify going ahead and still be protected against loss by a drop in prices. Present prices are here to stay, so far as price levels are concerned; we cannot await the industrial adjustment of the entire world. Factory fires must be kept burning and wheels turning, and labor must be employed at a scale of wages commensurate with the prices of commodities."

Appeals have been sent to the governors of the states and mayors of principal cities by the committees, requesting conferences with their business interests that are now awaiting building and highway construction.

PERSONALS

Worth, George, has been appointed chief engineer of the city water works of Waukegan, Ill.

Wuest, Charles Jr., formerly engineer of roads, United States Nitrate Plant No. 4, has been appointed office engineer, Division of Highways, Illinois Department of Public Works and Buildings, with headquarters in Springfield.

Carter, H. R., state highway engineer of Arkansas, has resigned to engage in private practice.

MacDonald, Thomas H., has been appointed engineer in charge of work under the Federal-aid road act by Secretary of Agriculture Houston. He is 37 years old and was educated as a civil engineer at the Iowa State College. After a short period in railroad work, he became, in 1904, assistant professor of civil engineering in charge of road investigations at Iowa State College. Since then he has been devoting himself to the highways of the state. The first legislation toward state supervision of road work in Iowa in 1906 placed this work under the supervision of the Iowa State College, and Mr. MacDonald became the executive officer at the beginning. As the work increased, an engineering as well as an administrative staff was placed under his direction, and when the Iowa Highway Commission was created as an independent body he was made the state highway engineer and its executive officer.

For some time he will concentrate on problems arising from the increased apropriations for federal aid. It is planned that in the near future he will formally assume the position of director of the Bureau of Public Roads, made vacant by the death of Logan Waller Page.

Mr. MacDonald has been very active in a number of highway organizations and has been prominent in the American Association of State Highway Officials.

Greene, Frederick Stuart, has been appointed state commissioner of highways of New York to succeed Edwin Duffey, the senate having confirmed Governor Smith's nomination. Attorney-General Newton has ruled that commissioner Duffey's term of office expired a year ago.

Fuller, Royal K., has been appointed secretary of the state commission of highways of New York.

U. S. CIVIL SERVICE.

The United States Civil Service Commission announces open competitive examinations on May 29 for the positions listed below. Vacancies in the Bureau of Public Roads, Department of Agriculture, at the salaries indicated and in positions requiring similar qualifications at these or higher or lower entrance salaries, will be filled from these examinations. The entrance salary within the range stated will depend upon the qualifications of the appointee and the duty to which he is assigned. Competitors will not be required to report for examination at any place, but will be rated on general education (relative weight, 20), and technical education, experience and fitness (relative weight, 80). The compensation and duties of these positions and minimum requirements for eligibility for appointment are as follows:

Chief of Road Survey Party ($1,800-$2,100).

Duties—Management of parties making surveys for road work, preparation of plans and estimates for highway construction, and management of camps for such work. Requirements—At least four years' preliminary civil engineering experience or graduation from course in civil engineering, and, in addition, at least two years' experience as chief of survey party engaged on highway or railroad work or else one year's experience as chief of such party and two years' experience as instrument man in such party. Age—25 to 55.

Transitman for Road Surveys ($1,200-$1,800).

Duties—Direction of transit section of survey party, keeping notes, making computations and drawing based on field notes, and such other duties as assigned. Requirements—Graduation from civil engineering course or at least three years' preliminary civil engineering experience, and, in addition, at least one year's experience as transitman on surveys made with same degree of accuracy required on highway and railroad surveys. Age—22 to 55.

Highway Draftsman ($1,200-$1,800).

Duties—Plotting notes, drafting, tracing, and computing quantities. Requirements—At least two years of civil engineering course, including instruction in engineering drafting, graduation from standard high school or course of study equivalent to that required for such graduation, and at least two years' drafting experience in civil engineering office. Each applicant must submit tracing of drawing to be furnished him by Commission, accompanied by statement under oath that tracing was made and lettered entirely by applicant in stated time. Tracing will be given consideration in rating subject of technical education, experience and fitness. Age—20 to 55.

The Commission announces examinations for positions listed below on May 21. The duties of appointees will consist of making surveys of bridge sites, the design and preparation of plans for highway bridges, the superintendence of their construction, and their inspection. Competitors will be examined in following subjects: 1, Practical questions in highway bridge engineering (relative weight, 60), and 2, Education, experience and fitness (relative weight, 40).

Highway Bridge Engineer ($1,800-$2,100).

Requirements—At least five years preliminary engineering experience, successful completion of each year of engineering course being accepted as equivalent to 15 months of such experience; in addition, at least three years' experience in bridge engineering, of which at least one year must have been in highway bridge engineering. Age—21 to 40.

Junior Highway Bridge Engineer ($1,200-$1,600).

Requirements—At least four years preliminary engineering experience, successful completion of each year of engineering course being accepted as equivalent to one year of such experience. Age—20 to 30.

Applicants should at once apply for Form 1312, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C.

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI NEW YORK, APRIL 26, 1919 No. 17

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Editorial Notes 303
Public Work Is Booming—Day Labor on a Large Scale—Scavenging Unsewered Districts—Planning Refuse Collection.

The Army's Utilization of Camp Wastes (Illustrated). . . 304
Last year for the first time the army changed from its established plan of incinerating refuse to that of utilizing it. What was done, and how, and the figures giving the details are told by one who was directly connected with the work, F. C. Bamman.

Avoiding Duplicate Street Names..... 308

Deep Well Pumps at El Paso..... 308
Recent developments in the water supply of this city.

New Brunswick's New Dam..... 308
A concrete dam built in an existing reservoir to increase the flooded area.

Efficiency in City Scavenging (Illustrated)..... 309
How a city systematized the collecting of night soil, securing more efficiency and economy. Also suggestions for planning a system for collecting garbage and other refuse.

Columbus' Board of Purchase..... 311
Report showing how it saved money for the city in 1918.

Municipal Photograph and Blueprint Plant (Illustrated). . 312
Used by the city of San Francisco for a number of purposes.

Dumping Refuse at Oakland..... 312
Making land along the waterfront with garbage and hydraulically dredged sand.

The Week's News..... 313

News of the Societies..... 317

Personals 317

Industrial News 318

Contract News 317

PUBLIC WORKS BOOMING.

A year ago the country was asked to place foremost in everything the idea of saving—saving money, food, and materials. Now the appeal is to spend—not extravagantly, of course, but in all directions where spending will secure those things that are useful. Especially are cities, counties and states asked to begin public works as soon as possible. And they are doing it. Billions of dollars are or soon will be available for such work, and contracts are being let by the hundred. Last week's issue of Municipal Journal listed considerably more than two hundred lettings of public work, to be held within the next month. Certain of these were for more than one contract; and the list did not include hundreds that were too small to interest outside contractors. Moreover, more public work than ever before, we believe, will be done by the direct employment of labor. From which considerations it seems certain that, if necessary materials can be obtained, next June will find more public work under way than ever before in the history of the country.

All the best contractors will shortly be loaded up with work, from present indications, and those who wish to let work to such or to obtain efficient foremen and mechanics for work on the day labor basis will need to act promptly.

DAY LABOR ON A LARGE SCALE.

Constructing a two-million dollar sewage treatment plant with municipal employes is the unusually big job undertaken by the sanitary commissioners of Indianapolis. Projects even larger have been carried through successfully by other cities, but nevertheless the size of this is sufficiently unusual to attract attention, and the success of the plan will undoubtedly be watched closely by all the cities of the country.

SCAVENGING UNSEWERED DISTRICTS.

In very few, if any cities are sewers laid within serviceable distance of all residences, and in many of those of fair size not more than 50 to 75 per cent of the houses are connected with the sewer, while hundreds of small communities have no sewers at all. Because a town can not afford sewers, however, it should not feel that there is nothing that it can do or should do in the matter. It is just these small, unsewered communities that the danger from fly-borne typhoid is greatest, and the officials should enforce such regulations and take such other measures as will, in the absence of sewers best conserve the health of the community. A

sanitary pail system, with strictly regulated collection and disposal, is perhaps the best so far developed. Suggestions concerning planning such a system will be found in this issue.

PLANNING REFUSE COLLECTION.

The article just referred to has a wide application, the suggestions given for planning a collection system applying also to garbage, ashes and other refuse. We suspect that in the great majority of cities the collecting of refuse develops itself like the familiar Topsy—it "just grows," without any careful planning or systematic laying out of routes to equalize work or secure maximum economy. When engineers take charge of such work, however, they should realize that it admits of planning almost as carefully and scientifically as a system of sewers. Moreover, the money involved is greater than that by a sewerage system; that is, the annual expense for collection is greater than the interest, depreciation and maintenace cost of a sewerage system covering the same area.

The general principles laid down in this article deserve careful consideration. They can undoubtedly be improved by collaboration of others working upon the same problem; but the greatest need is for working factors by which the principles can be applied. How many houses can a collecting wagon call at per hour? What is the most economical size of wagon under different conditions of street grade, length of haul, etc.? Engineers can render the greatest service to themselves and the profession at large by carefully studying these subjects and making the results known for comparison, so that there may be developed a science of refuse collection, which there is not at present.

THE ARMY'S UTILIZATION OF CAMP WASTES*

Change of Army Practice from Incineration to Utilization Not Detrimental to Health and Netted Government Two Million Dollars a Year—First Utilization Contracts—Present Contracts Reduce Waste of Food.

By F. C. HAMMAN.*

There are no data to indicate that the policy of waste utilization, rather than its destruction, has injured the health of the men in camp, or that of the workmen regularly handling such wastes.

The incineration of camp wastes would have required an annual operating cost of about $1,000,000. Their utilization, on the other hand, produced last year at least 10,000,000 pounds of pork and considerable glycerine suitable for use in explosives.

During the four months' period preceding the armistice, intensive conservation saved the army some 45,000 tons of food; value about $12,000,000. It reduced the daily per-capita wastes an average of a half pound for the entire period.

In spite of the decrease in per capita waste, a revision of the form of contract increased the revenue received by the Government for its wastes over $500,000 in six months.

CHANGE FROM INCINERATION TO UTILIZATION.

The army's experience with the utilization of camp wastes, seemingly points out the fallacy of a theory that has cost millions in army appropriations; a fallacy that is still prevalent in some of our cities and one causing huge economic losses to the country at large.

Its experience has unquestionably demonstrated that the household wastes of congested communities, their garbage, paper, rags and like materials, can be salvaged without endangering the public health of such communities to the slightest degree, and that the net cost of thus disposing of such wastes is far less than that of any destruction method.

The army's interest in camp waste utilization only began with the National Army cantonments. The almost universal method before that time was incineration—"the only sanitary method." Credit for building the first incinerator in this country goes to the army; the method seemingly appealed to its sanitarians and was rapidly introduced into all permanent army camps and posts.

Just why incineration has continued to have such a strong hold in army circles is not clear. Certainly the percentages of incinerator failures at army posts is as high as that for furnaces used in disposing of municipal wastes. The army, however, was seemingly unaffected by such failures or with the successes that other and cheaper methods of disposal were having in municipalities: As late as 1916, General Order No. 45 provided that "For detachments or companies in camps . . . the incinerator will be installed."

The manual on "Military Sanitation and Management of the Sanitary Service" as reprinted for the Officers' Training Camps, instructed the reserve officer that "There are briefly three ways of disposing of kitchen garbage—burning, carrying away and burying. In a general way their relative sanitary value is in the order named. . . . Kitchen waste at permanent camps or semi-permanent camps is best disposed of by incinerators, preferably in a camp kitchen incinerator, which if properly constructed and administered will dispose of all dry and liquid garbage of the company, including waste paper and sweepings."

Possibly the fact that army waste disposal matters were so largely a province of the army medical departments, whereas the tendency in municipal corporations is toward treating disposal as an engineering problem rather than one for the medical profession, may have had an important bearing on the rigid adherence to the destruction method.

Responsibility for the change in waste disposal policy upon our entering the war is not firmly established, and in all probability the wastefulness of incineration and the possibility of its elimination without endangering camp health was called to the War Department's attention by a number of different people at about the same time. England was already extensively utilizing her camp wastes and observations of her success by our staff officers must have carried no slight weight.

THE FIRST UTILIZATION CONTRACTS.

In attempting the utilization of its waste, the army was confronted by the same question of method as confronts every city. In operating incinerators, disposal had been by its own forces; with utilization, should this same policy be continued or should the contract method be the basis of operation? The army very properly held that any attempt to develop the large organizations which the utilization of their wastes would require was hardly a proper war-time activity.

The first of the many tasks which confronted the army officials charged with working out the utilization, lay

*Consulting engineer, Washington, D. C.

in finding organizations capable of handling the segregated waste. This proved no slight task. Existing organizations more or less skilled in such work were called upon, but the number available proved far inadequate. The majority of the present contractors had but little experience in waste utilization prior to their army contracts and only became interested in such work through the educational efforts of the Quartermaster Department.

The contracts formulated required first of all protection to the health of the camps and secured for the government some return for the wastes turned over. The contractors on their part took considerable risk; they had little or no guarantee as to the quantity or quality of the wastes they were purchasing; their capital investment was heavy, with much uncertainty as to the permanency of the camps, etc. Such contracts all expired on the 30th of June, 1918.

The specifications of the above contracts provided for segregation into fats and tallows, bones and other garbage; paper, rope or twine, bottles and jars, and tin cans. One contract generally included all the waste from a given camp and elaborate sanitary requirements were included, the contractor, for example, not being permitted to dispose of the garbage within six miles of the camp.

Determining a fair basis of payment under these first contracts was a matter causing no little trouble. It must be remembered that garbage up to that time had been considered by the army as "abandoned property" and that absolutely no records existed as to quantities—some camps in fact made disposal contracts before they were completed. Plans of operation, the army

FED ON GARBAGE FROM CANTONMENT AT CHILLICOTHE, O.

personnel, sanitary regulations—all the confusion and turmoil incident to the early days of the war, reflected themselves in the first contracts. It is not strange that some confusion resulted. The army's success with its first year of utilization would be a proud achievement at any time and for any organization; when the conditions of that year are remembered, its success cannot be overestimated.

There existed during the early days of the war a seemingly general impression that the amount of camp wastage, particularly food, was excessive. Here again it must be remembered that the army was undergoing a tremendous expansion, almost over night. It had not the time and opportunity to pick and choose its cooks and kitchen workers. Its first duty was to feed the incoming men somehow. All complaints received by the Food Administration in regard to camp wastage were referred to the writer, who was in charge of its Garbage Utilization Division. In almost every case, such complaints, when investigated, were found to be due in the main to the complainant forgetting that a large amount of garbage was inevitable with the great number of men being fed.

Payments under all of the contracts expiring July 1918, were on the basis of so much per man or per kitchen per month. That the amount of garbage turned over to the contractors under this arrangement varied in each camp, or even in each mess is obvious. Difficulties in administration arose, but in the main the contracts proved satisfactory. Prices paid under these contracts are given in Table No. 1 herewith. Such prices are not directly comparable, as the contract specifications varied somewhat.

THE PRESENT CONTRACTS.

It was readily apparent to the army officials that the great opportunity for saving in the army lay in conservation, rather than reclamation; their main effort had been to reduce the amount of material presented for reclamation—a pound of potatoes saved and available for human consumption at some future time will always be worth more than the best price that can be paid for such potatoes if only suitable for hog food.

The contracts succeeding those given in Table No. 1 were accordingly arranged to meet the conservation program of the Quartermaster Corps, not for the contractors' convenience in disposal or because greater sales values could be obtained for the segregated waste that followed. Bread is being kept from other kitchen wastes, not because it is fine chicken food and worth more as such than as hog food, but because it was necessary to conserve wheat and, by requiring that all bread wastage be kept separate, one camp could be weighed against another and special attention paid those showing high per capita figures for this class of garbage. For a like reason, cooked meats, greases and the other separations were decided upon.

The army officials state that the purpose of the present contracts and the regulations on which they depend (Special Regulation No. 77) is threefold, as follows:

1. To bring about a reduction in mess waste.
2. To increase the revenue to the Government.
3. To make available to the Government, in the event

HOGS DOING THEIR BIT FOR THE U. S.
Disposal contractor, Henry Knight & Son, Chillicothe, O.

of an emergency, that part of its wastes as contained glycerine.

Before taking up the success or failure of the present contracts in meeting these three purposes it may be well to consider the contracts themselves. The Southern Division in its Bulletin No. 88 (Fort Sam Houston, July 16, 1918) gives the following summary:

Table No. 1.—Prices Paid for Camp Wastes from Cantonments.
Contracts Expiring June 30, 1918.

Cantonment	Price Received	Estimated Number of Men
Ayer, Camp Devens...	*$2,160.00 per mo.	37,865
Yaphank, Camp Upton	.05 per man per mo.	39,111
Wrightstown, Dix	.05 " " " "	37,638
Admiral, Camp Meade	.05 " " " "	37,537
Petersburg, Lee.....	.04 " " " "	44,578
Columbia, Jackson....	.03 " " " "	40,647
Atlanta, Gordon.....	.04 " " " "	40,148
Chillicothe, Sherman..	.056 " " " "	37,589
Louisville, Taylor.....	*.09 " " " "	41,560
Battle Creek, Custer..	.05 " " " "	35,992
Rockford, Grant.....	.05 " " " "	37,364
Des Moines, Dodge...	.05 " " " "	44,529
Ft. Riley, Funston....	.06 " " " "	45,960
Little Rock, Pike.....	.06 " " " "	38,776
San Antonio.....	Bones.....$11.00 Garbage..... 1.90 Waste paper..... 4.00	43,105
Amer. Lake, Lewis...	*.85 per man per mo.	46,641
Tenafly	.05 " " " "	25,000
Newport News.....	.03 " " " "	25,000

*Price includes manure.

Kitchen Waste.—Every effort is being made to conserve and increase the food resources of the country. Conservation of food materials is an important feature in military training. Waste of food is seldom due to ignorance; it is usually the result of neglect on the part of organization commanders and wanton laziness on the part of cooks and other kitchen forces. Needless destruction or waste of food is to be regarded as a serious military offense, which calls for prompt and drastic disciplinary measures. There is, however, from every kitchen a quantity of garbage which consists of materials unfit for human consumption, but of value for feeding to animals.

Kitchen garbage is disposed of by contracts made by the Quartermaster Department with persons engaged in hog raising. The main purpose in letting these contracts is to increase the country's production of meat. Arrangements will be made for collection of garbage so that there will be no nuisance to the camp by reason of scavenger service, and so that hog raisers may obtain fodder which is free from substances injurious to animals. Contractors are required to collect kitchen garbage in a cleanly manner. They are required to furnish a sufficient supply of cans, so that there will be one in each kitchen at all times. The cans are to be cleaned by the contractors at some place outside the camp limits. Swill is not to be emptied from one can to another. Cans are to be removed from kitchens to the contractors' wagons on trucks, and clean cans are to be left in the kitchens. The standard of cleanliness for garbage cans is the same as that required by dairies for milk cans. There is to be no grease or swill either on the outside or the inside of the cans. They should be perfectly clean and have no odor. Contractors are required to make a deposit with the Quartermaster. In case of failure to remove any or all of the garbage from the kitchens, or in case of failure to carry out other terms of the contract, the work which has been neglected may be done by other persons employed by the Quartermaster, and the cost of the same charged to the contractor. Reports of failure on the part of any contractor to properly perform his part of the agreement are to be promptly made.

Separation of Kitchen Wastes.—The cans furnished by garbage contractors are for materials which are edible for hogs. All other kitchen refuse is to be placed in other receptacles and disposed of as directed by proper authority. In the contractors' garbage cans will be placed only dry garbage which is fit for hog feed. The following articles are injurious to hogs and will not be placed in the garbage cans: Coffee grounds, broken glass or china, soap, lye, washing powders, dish-water, papers, cans, rags, floor sweepings, ashes and other dirt. It will be the duty of organization commanders to see that arrangements are made for separation of kitchen waste, and that cans belonging to hog raisers are not used as receptacles for substances injurious to animals.

Disposal of Other Camp Refuse.—Provision may be made for disposal of camp refuse other than kitchen waste, so that valuable materials may be utilized and the work of camp police may be facilitated. Upon inquiry, persons are often found in the vicinity of army camps who are glad to utilize waste materials, the disposal of which would otherwise entail much time and labor.

NEW CONTRACTS REDUCE WASTE.

Prior to July 1, 1918, the average mess waste for all camps in the United States was nearly two pounds per man per day. This is far in excess of the wastes reported for municipalities and even exceeds the wastage per person of first-class hotels, where it is impossible to use up "left overs" as in the average household.

A comparison of this figure with that for the months following June is probably not quite fair, in that the average figure includes wastage records for the very earliest months of our participation in the war. Such figures are known in some instances to be in error and reasons for high wastage in particular months have been established.

It does point out the needs of a contract making possible an analysis of the component parts of camp wastes and permitting of accurate comparison between various units or various camps. This is something the old contracts did not permit; the matter depended largely on the cooks and officers of individual companies, who in turn were overwhelmed with other work and to many of whom, the question of studying garbage production, seemed foolish.

The effect of the new contracts on garbage production was prompt and positive. In October, for example, the average for the United States was 0.7 pound per man per day, a drop of over a pound in four months. Following October, the per capita increased slightly, but this upward movement has been checked and the present rate of wastage is again in the neighborhood of ¾ of a pound per man per day.

To many city officials a per capita wastage of this amount will doubtless seem extremely high. The writer questions whether an impartial investigation will disclose that the per capita waste of any of our larger cities is really much below ¾ of a pound. It must be remembered that the army is reporting its total wastage —not that part collected by some one of a number of collecting agencies, or neglecting disposal methods other than that provided by the municipality. A number of cities are reporting extremely low per capita figures, but the Food Administration, upon actually checking such data, generally found that large amounts of garbage were being disposed of in private incinerators, or that private companies were hauling the waste produced by hotels, apartment houses, etc. Not even an estimate of the amounts of garbage so handled was considered by such cities in determining their per capita wastes.

The increased waste per capita during November and December was undoubtedly due to carelessness in the camps. Municipal records indicate that they, too, had a greater wastage during these months than previously. Probably with the signing of the armistice, people in general felt that their moral obligations to save foods ended. In the case of the municipalities there has been no organized effort to check this increase and present figures will show a considerable advance over those of last year. In the army this tendency towards increased wastage was immediately checked by the action of the Quartermaster Department officers.

The gradual reduction in per capita waste for the

four months, July, August, September and October, clearly indicates that the new contract has achieved its main object, namely a reduction in camp waste. The temptation to build up an estimate of what such a reduction means is too strong to be resisted; the results are surprising. Assuming that the reduction for the four months' period is a pound, or that the average saving per month has been ½ pound, the food saved during the four month period mentioned is roughly 60 pounds per man. Since the average number of men in camp during that period was approximately 1,500,000, there has been saved from the garbage and made available for other uses some 45,000 tons of army food stuffs. Assuming still further that the average cost of army food is 13 cents per pound, gives the rather astounding total of $11,700,000 saved in four months through the operation of these contracts.

The administrative steps which have been brought about by these results have been better discipline and control of the men through definite regulations, the better administration of the messes through educational literature, and primarily through the training officers, cooks and bakers in the army schools.

Opponents to the present system, particularly the idea of separation, point out the temptation to mess officers to destroy food waste, rather than save such waste and be censured because of high wastage. In view of the national emergency which demanded conservation, army officials in general are undeserving of such criticism. Some tendencies to destroy food waste have been noted, but on a whole the idea of separation has been obtained with this, to the army, radical idea.

That destruction of food did not take place is evidenced by the results of Table No. 2, which shows that as the details become familiar, increasing amounts of segregated wastes were reported—while the total wastage at a camp may have decreased from month to month, the decrease has been largely in the item of other garbage, and the per capita waste reported for bread, meats, fats, greases and bones has shown an increase. This showing certainly refutes the idea that any great amount of food wastes has been surreptitiously disposed of.

Table No. 2.—Amount of Bread, Meats, etc., and Bones Segregated.
Total for United States.

1918	Bread	Meats	Bones	Total of all Garbage
	Pounds Segregated.			
July	189,549	230,232	1,077,538	18,811,638
August	247,723	254,928	1,279,828	22,858,492
September	273,559	388,827	1,492,084	23,353,594
October	298,711	624,398	1,638,695	23,881,625
November	258,273	407,423	1,534,133	23,273,625
December	201,761	345,744	1,200,779	20,895,457
1919				
January	148,010	385,645	809,681	16,456,153
February	105,591	253,877	504,656	10,195,963
	1,723,177	2,891,074	9,537,394	159,726,547
	Relative Amounts.			
1918				
July	100	100	100	100
August	130	111	119	121
September	144	169	139	124
October	158	272	152	127
November	136	177	143	124
December	106	150	112	111
1919				
January	78	167	75	87
February	56	110	47	54
	Percentages.			
1918	Per cent	Per cent	Per cent	Per cent
July	1.0	1.2	5.7	100
August	1.1	1.1	5.6	100
September	1.2	1.7	6.4	100
October	1.2	2.6	6.8	100
November	1.1	1.7	6.6	100
December	1.0	2.0	5.7	100
1919				
January	0.9	2.3	4.9	100
February	1.0	2.5	5.0	100
Average	1.1	1.8	6.0	100

HOW THE GOVERNMENT BENEFITS.

In determining whether the new form of contract likewise meets with the second object given by the War Department officials, an increased revenue to the government from its camp wastes, it is necessary that certain assumptions be made and the origin and theory of the contracts examined.

The fact that England had quite extensive reclamation plants has already been mentioned, and in the British system the question of fat recovery was of paramount importance. England's chief explosive has long been a powder known as "cordite." A large percentage of this powder is nitro-glycerine and the question of securing sufficient glycerine for its requirements was one of the prime factors leading to England's conservation efforts. The Lnodon Times of November 5th, 1917, showed how important this matter had become. Under the heading "Army Economies—Effect of Costings System," it printed the following:

> At the beginning of the war broken meat and other table refuse was generally thrown into the refuse tubs outside the cookhouse and sold locally to farmers as swill for pigs. In March, 1916, however, a committee was formed for the purchase of army camp refuse. From waste fats glycerine is extracted for propellent explosives. Bones are saved, the fat extracted, and dry bone which remains crushed for poultry and other food. The present rate of annual output of refined glycerine from the military centres is 1,200 tons, which will provide propellent charges for, approximately, 15,000,000 18-pounder cartridges. The glycerine is obtained for the government at a cost of £59 10s. a ton. The price in America is nearly £350. The profits accruing to the army from the sale of refuse are on a large scale. At the present time the total revenue from the sale of by-products and swill is at the rate of over £900,000 a year, and the result of the economies has also been a very considerable contribution to our war-time resources.

That British cordite factories received sufficient glycerine to manufacture to the limit of their capacity was of course as important to this country as seeing that our own powder factories received sufficient supplies. Stringent steps were necessary to see that home consumption and export requirements were met. The glycerine situation in fact, was one of grave concern up to the very signing of the armistice and was a matter prominently in the army's mind when the garbage contracts were being formulated.

Aside from the increase in glycerine which segregation of meats and fats would give, was a question of curtailing as far as possible wastage of meat and wheat. The segregations, therefore, decided upon were those which would give these items separate from the other less important wastes. The assumed or ideal composition of camp garbage was taken as follows:

Item	Percentage	Pounds per ton
Bread	1	20
Bones	7	140
Meats, fats, etc.	9	180
Other garbage	83	1,660
	100	2,000

It is rather interesting to note how the actual figures compare with the ideal composition given above. In October, for example, after the camps had had a chance

to become familiar with the new regulations and contract operation, the following results were obtained:

Item	Assumed composition	Actual composition for October
Bread	1	1.2
Bones	7	7.4
Meats, fats, etc	9	2.2
Other garbage	83	89.2
	100	100

The above average actual figures are based on 29 camps feeding an average of 871,837 men.

(To be concluded)

AVOIDING DUPLICATE STREET NAMES.

In Newton, Mass., as in many other of the larger cities (Newton has a population of about 45,000), there are many duplications in street names which cause more or less confusion. The total number of named streets in Newton is about one thousand, and there are 367 duplications of names, although in some of these cases the terminal designation differs, as, for instance, Highland street and Highland avenue. Many of the names are used even from three to five times and one name occurs eight times. On the other hand, there are some thirty or forty instances where different sections of the same street are known by different names.

Changing the name of a street is often a considerable source of inconvenience to both the residents thereon and the general public, but city engineer Rogers believes that in Newton a certain amount of such changing could be done to advantage. A few months ago the board of aldermen of that city passed a resolution relative to the naming of new streets and renaming of old ones in honor of those Newton residents who lost their lives in the great war, and it is suggested that the idea of making such changes in the names be utilized partly or wholly for eliminating the duplication of names referred to.

DEEP WELL PUMPS AT EL PASO.

The waterworks system of El Paso, Tex., was originally privately owned and operated but was taken over by the city a number of years ago. Water is obtained from 44 wells averaging about 600 feet deep, except two of about 900 feet. The total production obtainable from these is ten million gallons a day and the present daily consumption varies from six million to ten million gallons. These 44 wells are all operated by air lift, the power being supplied by oil engines. About a car of fuel oil is consumed each day and the cost of oil has increased to such an extent that the cost is now about $600 a day as against $200 in pre-war times. This gives a cost for fuel of over $200,000 a year. The annual receipts of the system are about $500,000.

A new well was added recently to increase the available supply and, owing to the high and still increasing price as well as to the growing scarcity of fuel oil, electric power was substituted for oil in operating the new well. This well, which cost about $75,000, is believed to be the largest in the southwest and has a daily flow of about two million gallons. The pumping is done temporarily by two motors but the permanent equipment will be a 250 h.p. motor, and Layne and Bowler type pump, which will be installed as soon as conditions enable the factories to deliver materials.

Preliminary tests and estimates indicate that it will cost less than 4½ cents a thousand gallons to place water in the mains with the electric pump as compared to 8 cents using oil and air-lift. An additional advantage is that with the new system one man can operate several wells, while the old plants required a considerable number of attendants. The superintendent of waterworks, H. P. Jackson, to whom we are indebted for this information, says that it is more than probable that all wells drilled in the future by El Paso will use electric equipment, and a second well has already been started on this plan. When permanent electric equipments are installed at the new wells, each will be housed in a neat brick and stone bungalow covered with vines, the appearance of which will be an asset to the neighborhood.

"The lay of the land about El Paso is such that no geologic surveys have ever given accurate forecast as to where water will be found, and often a flow of excellent water will be reached just a few hundred feet from where a poor flow was found. The plan to be adopted will be the drilling of comparatively inexpensive test holes before the large casing is put down. A collapsible derrick about 75 feet high and ribbed together by steel plates has been constructed at a cost of $573 to be used in drilling future wells and test holes.

"While all the wells in new locations will probably be of the electrically driven type, if any new ones are put down at the plant where the battery of 44 are located they may be of the oil and air type, because some of the older wells may soon have to be cut off and new wells in the locality would use machinery and equipment already installed."

NEW BRUNSWICK'S NEW DAM.

The city of New Brunswick has recently completed a concrete arch dam in connection with its water supply, a rather novel feature of which is, that it was constructed in an existing reservoir. The new dam will raise the water behind it four and a half feet higher than did the old dam, the reservoir overflowing forty acres in addition to that covered by the previous reservoir. The original reservoir held 87,000,000 gallons, while the capacity of the new one will be 223,000,000 gallons.

The necessity for additional storage had been evident for some time and in 1911 a special committee advised an immediate raising of the height of the existing dam by three feet. In September, 1914, a serious water famine occurred and it was strongly urged that the new dam be built at once, but authority was denied to the board of water commissioners by the board of aldermen and work was postponed until commission government was installed. Meantime it had been decided to build a filtration plant and it was considered probable that the building of the dam would keep the water in the reservoir more or less turbid, therefore it was decided to postpone work on the dam until the filters were in condition to operate and clarify the water so rendered turbid.

Meantime, comparative plans and estimates had been prepared for both raising the old dam and building an entirely new one in another position. It was found that it would require more labor and material to raise the old dam than to build the new one; and in addition to the greater cost, there would be the risk of an accident during the reconstruction of the old dam which would put the reservoir out of commission. There were also other difficulties in connection with the reconstruction and expenses connected with continuously maintaining the use of the reservoir meantime, and it was decided to adopt the plan for an entirely new dam. Work on the

new dam was finally started in the fall of 1917 and was completed early in 1919.

The new dam is located 600 feet above the old one and is in the form of an arch with a spillway 200 feet long. It rests on solid shale rock and the two ends of the arch abut into similar rock in each bank. The maximum height of the dam is 23 feet, the crest is three feet wide and the base is nine feet wide. When the reservoir is filled, the water above the new dam will stand four and a half feet higher than that below it, which is held back by the old dam. The structure, however, is designed to retain the pressure of the water when the lower pond has been entirely drained.

The dam was constructed in the old reservoir without drawing off the water from the same, which water was eighteen feet deep at the center of the reservoir. The new dam was built in sections surrounded by tight cofferdams constructed with steel sheet piling, the concrete being poured in a set of forms which were used over and over again for section after section of the entire dam.

The consumption of New Brunswick reached a maximum during the war conditions of last year of about 7,000,000 gallons a day. A careful measurement of the streams flowing into the reservoir during the period of minimum flow in 1914 showed this to be only 1,800,000 gallons per twenty-four hours, although ordinarily the flow is several times this amount. It is apparent therefore that storage is necessary for furnishing at least two-thirds of the consumption during very dry periods.

EFFICIENCY IN CITY SCAVENGING

Introducing More Effective and Economical Methods into the Removal of Night Soil in a Southern City—General Suggestions for Planning a System of Refuse Collection.

From time to time, in order to meet changed conditions and to keep abreast of modern trends in our cities, superintendents of garbage collection and scavenging systems will find it necessary to rearrange their systems to secure greater efficiency and thus reduce the costs which, in many cases, are rising at a far too rapid rate. Data on the subject of making collection systems more efficient and less troublesome are meager and the following description of an actual experience and suggestions based upon the same may be of value.

In the reorganization recently of the department of public health of a large southern city, it became necessary to entirely reconstruct the machinery of the scavaging system, whereby night soil was being collected from the unsewered areas of the city. Under the unwise conditions of the contract whereby the night soil was being handled, it was practically impossible for the contractor to fulfill his agreement and survive bankruptcy; while collections were being made at long and irregular intervals.

This city, with a population of about one hundred thousand, served the outer fringe of its inhabitants beyond the sewer lines by means of a pail system of privies. Some twenty thousand people, with 3,200 single and 450 double-can privies, were dependent entirely upon the contractor for routine collection of night soil. The contract provided for weekly collections to be made under a charge of $1.50 per quarter, with an additional charge of ten cents per can where there was more than one can. The firm handling this contract was the one already engaged in caring for the garbage and rubbish of the city.

Among the more important weaknesses in this contract were the lack of any supervision by the city; the absence of any means of enforcing payment of the fees for collection; the arrangement whereby no penalty was visited upon the contractor for failure to make regular collections; and in general, the weakness and lack of definity of the contract. An almost entire lack of reliable records of the privies installed and their locations, and the entire absence of any formal report by the collecting wagons of the privies scavenged daily, added to the confusion. Much of this lack of information was due to the fact that many property owners actually did not know the street numbers of their own houses.

With matters in this state, affairs galloped rapidly from bad to worse. Though the sanitary privy system had been installed in the spring and summer of 1918 as part of a general campaign for bettering health conditions in the city and county, it was doubtful if, under these conditions, better sanitary conditions were prevailing than were obtained before its installation. By the fall of that year, so many complaints were coming in—sometimes as many as 100 per day—that a reorganization appeared absolutely necessary. Moreover, the overflowing, unscavenged cans presented a health problem that could no longer be neglected. All collections were made by day and the careless methods generally employed caused considerable odor and left a trail of liquid night soil along the streets leading to the disposal stations.

The fault was not entirely with the contractor, however. The refusal or neglect of many patrons to pay regularly, the great scarcity and poor quality of the labor available, with its consequent untrustworthiness, and an unprecedented series of rains which made the alleys (barely passable at the best) sloughs of bottomless mud, all contributed to make impossible the carry-

OPEN TYPE OF DISPOSAL STATION.
Barrel of disinfectant at left.

COVERED TYPE OF DISPOSAL STATION.
Collecting wagon unloading cans.

ing out of the contract and to make the operating expenses mount far above the income.

The reorganization work began with a thorough review of the conditions underlying the causes of failure, and included a scientific study of the layout and topography of the city with a view to the planning of the most feasible, practicable and economical routes for the wagons. Sites of additional needed disposal stations were also tentatively selected.

This preliminary study revealed more clearly the faulty conditions described in the preceding paragraphs and pointed out the way for some of the reforms. Among other things, it showed clearly that accurately laid out routes to include each and every can in the city were necessary.

The laying out of these routes was impossible from the data at hand. It was therefore necessary to build up the entire work from the bottom. A map of the city was first drawn on tracing cloth, the scale being about two hundred feet to the inch. The size of this map necessitated its construction in sections, which were later fastened together. At the same time that this map was being made, a copy was made of the contractor's books, which were supposed to show the location of practically all of the privies in the city, and whether they were single or double. To determine the accuracy of this information, the locations given were checked, either by automobile or by means of inspectors working on foot.

COLLECTING WAGON CARRYING 70 CANS.
Six of these are in operation.

As it was found that not more than 85 per cent of these were accurately located and described, it was determined to check the entire areas served by the can system and locate and describe accurately every sanitary privy. This was done by means of inspectors attached to the office and the results were approximately 100 per cent correct.

The locations thus obtained were plotted on the map and gave a very accurate basis for the graphical location of the collection routes. The relation of every can to nearby cans, or to others scattered in the same section of the city, was apparent at once.

With this as a basis, tentative routes were then plotted in pencil upon the map, due weight being given to the size of the load as influenced by the topography, the distance from the disposal station, long and short trips for morning and afternoon, and the various other details to be observed. These tentative routes were then checked over by automobiles to determine whether or not they were passable for the collection wagons and whether any slight changes in their layout might improve them. When the location had been finally decided upon, the route was placed upon the map in water-colors.

In laying out these routes, every effort was made to avoid extra travel, to make all heavy hauling down-grade, to end the route as near as possible to the disposal station, and to so balance the routes that it would be possible to make such combinations of long and short hauls as might yield best results. As much as possible, the wagons, while loading or on the way to the disposal station, were kept on alleys and back streets.

This map, with the routes completed, was of great value. It showed at a glance the relative amount of work necessary in each section of the city. As a rule, this amount is dependent nearly as much upon the distance to be covered as upon the number of cans to be collected. It also showed graphically the areas needing additional disposal facilities to reduce overlong hauls and thus expenses.

With the basic data as to the number and location of all cans and with the graphic layout of the collection routes, the remainder of the work was comparatively easy. It was possible to compute very closely the cost of collection and to make very definite recommendations as to changes.

These recommendations as finally carried out included the installation of an additional disposal station, whereby a long haul from an area containing about 700 cans in the north end of the city was cut in half; the establishment of regular and specified collection routes to be covered on specified days; the taking over by the city of the general control of the work; the supervision of the collection by a city paid inspector; the collection of all money by the city, which afterwards paid the contractor a definite amount for each can actually collected; the division of the city into five collection districts, and the assignation to each of these districts of a field inspector. The duties of these men were to see that the specified routes were followed, to check and report on all privies scavenged every day and to follow up complaints.

Among the minor matters considered and afterwards put into practice was one whereby the task system was put in practice for the men. To each wagon was assigned a certain collection task, estimated to require about five and a half days work at the regular rate. A weekly rate was then granted the men, with the understanding that when the cans from the entire district had been collected they were free to lie off, but fixing a penalty in case the work was not done. As a result, when rain did not interfere, the men usually completed their work in 4½ to 5 days, but received pay for 6 days. This greatly facilitated getting a better class of men and practically eliminated the labor turnover.

Under the new financial arrangements the city collected the money, the bills being sent out from day to day under the continuous system. Also the rate was increased, to care for the extra cost of the inspectors, though it has since been shown that this was not absolutely necessary. The contractor is paid by the city for every can collected as shown by the daily reports of the field inspectors. The contractor furnishes the teams and the labor, while the city furnishes the supervision. To date the arrangement has worked exceedingly well, and where formerly complaints were coming in at the rate of one hundred per day, but few are now being received. The pail system, once condemned, is now doing its work.

SUGGESTIONS FOR PLANNING REFUSE COLLECTION.

The general principles, and to a considerable extent the details, of the procedure described can be applied to the collection of garbage or other refuse as well as of night soil. Necessity for reorganization may be due to suburban development that has overloaded established routes; increase in the extent of the work that has made the old methods inadequate; change in conditions, such as separate collection of garbage and rubbish; change in the labor situation; or necessity for increased economy. Of course the method applies to the planning of an entirely new collection system.

The work should begin with a thorough investigation, which should show clearly and in detail wherein the system does not work and why; whether costs are excessive and why; who or what is to blame for inefficient operation; and if there is a nuisance, the cause and remedy.

The conclusions of the investigation may be tabulated somewhat as follows:

Faults of the System.	The Reasons Why.	Remedies for the Faults.
Irregular collections.	Poorly laid out routes; increased loads; careless laborers.	Remapping of routes; better organization.
Financial.	Wagons not collecting enough to pay cost plus overhead.	Better routing of wagons to secure quicker loading and unloading and less dead haul; more dumps to shorten hauls.
Non-payment of fees to contractor.	No penalty for delay in payments; no means for enforcing collections.	Ordinance requiring payment in advance and at specified times.

With the causes of trouble dissected in this fashion, effort can be directed intelligently and confidently toward remedying them. In this work a map, worked out and used as described above, will be almost invaluable. The routes, whether for garbage, rubbish or night soil, should first be laid out in pencil. Considerable manipulation may be necessary to secure the most economical routing and the routes should afterward be checked on the ground, to determine whether or not they are passable, feasible and economical. In laying out these routes, especial care should be taken to secure hauls as short as possible, to end the routes near the disposal station or dump, to make the long haul with an empty wagon, if there must be a long haul, to make all heavy hauls downhill and to arrange the routes so as to eliminate all unnecessary travel.

With the routes finally located, one may be tried out in the field. As laid out, the routes should furnish an average load for each trip, unless there is immediate prospect of an increase for which provision may be made. Where there is prospect of a gradual growth, the routes may be so laid out as to be capable of easy extension by division and combination.

The preliminary study should show the locations of all dumps and disposal stations and these should be plotted on the map. Where hauls are shown to be overlong, additional disposal stations should be provided. The map will furnish an easy means of locating such dumps, and of routing wagons to them by the best ways.

The actual work on the routes laid out may suggest modifications in length or route. It should also be studied with a view to learning what one team and gang can accomplish. It is recommended that, with this as a basis, the task system be adopted, each gang being given a certain amount of collection work to do each week, with time off when this has been accomplished.

With the routes laid out according to the above data, with a finger on the faults disclosed by the investigation, and with the better class of labor that will be attracted by the task system of payment, the remainder of the work should not be difficult. A simple but complete system of reports should be put into practice. The captain of each gang or man in charge of each wagon should fill out a short daily report, giving the route number, houses visited, their addresses, etc. There should be a follow-up system to check all complaints, locate the reason for the trouble and finally settle them. At the main office there should be a card for each house, on which should be entered the collections, payments, etc. Bills should be sent out regularly and payments enforced promptly. In short, the application of common-sense should continue through the reorganization and into the operation period.

With cities of every size and with local conditions of varying natures, it is of course impossible in an article of this length to cover all conditions, or even a fraction of them. The general procedure will, however, generally be found applicable to the problems of the average city.

COLUMBUS BOARD OF PURCHASE

Considerable Sums Saved by Knowledge of All Department Needs and of Market Fluctuations, Personal Bargaining, and Standardization of Supplies.

Columbus, O., maintains a Board of Purchase, which is said by its secretary, L. J. Guthke, to have saved the city considerable money. The report of the board for 1918 is as follows:

"The purchase department of this city has decreased the cost of municipal government. Centralized connection with all department needs for supplies and material, increasing knowledge as to market fluctuations, personal contact with selling agencies which permits exercise of bargaining practices, the greater opportunity centralized buying gives to establish economic standardization of supplies, all helped to reduce cost to that minimum which good business practice seeks.

"The year 1918 was peculiar in that cost in a war year is not open to comparison of cost with peace years. Government control over price, manufacturing, priority of shipment, etc., affected all public, as it did all private purchases. Though in the main the city had to pay higher prices for supplies furnished, the purchase department did effect substantial savings along some lines by anticipating market movements, purchasing in the open market instead of under bids which were submitted naturally under the necessity of the seller to protect himself from possible large advance in the future prices he might have to pay for supplies. It has also saved money by watching every angle of cost as illustrated by having goods shipped on the basis of the city, instead of the shipper, paying the freight, thus saving what would otherwise have to be paid in war tax on freight shipments.

"After thorough explanation to, and the moral endorsement thereof by the city council and city attorney, the board has a number of times violated the charter provision in the purchase of supplies, but on each occasion the law has been broken only for the purpose of benefiting the city, by securing at lower cost the things the city had to have, when purchase according to the charter law meant to lose the advantage of an actual bargain, or to prevent the city from buying before market prices were scheduled to go higher by larger amounts.

"To illustrate this statement: If we had accepted the lowest bid received after advertising for coal, we would have paid $26,730 for coal we purchased in the open market for $19,936. If we had taken bids on soda ash we would, at existing quotations, have paid $49,420 for soda ash which, by purchase as we could locate bargains, was bought for $34,280. The best bid received for rail-

road ties needed was $950, which we bought in the open market at $900. These instances could be multiplied, but in these three are savings of $21,984.

"Supplies purchased in 1918 on 5,588 purchase orders aggregated $434,661.86, against 1917 purchases of $423,654.04 on 6,647 orders. Contracts awarded in 1918 amounted to $454,725.41, compared with $452,415.05 in 1917. The increased expenditures on decreased purchase orders was attributable to war prices.

"This board has urged the necessity of being given a storekeeper. Such a position would effect a saving greatly in excess of the cost. In addition, this department should not be placed in the condition it faces every year with regard to the purchase of supplies needed between January 1 and the date when appropriated funds were available. The failure to have funds during this period of time has cost the city much money through loss of cash discounts for bill payment by given dates.

"In other words, and as direct and actual illustrations of the loss the charter provision as to appropriations involves, this board was compelled to pay $3,290 for 110 tons of hay after appropriated funds were available, which could have been purchased for $2,970 in January, before appropriated funds were available. On this one item the charter's provision caused $320 loss to Columbus.

"This board suggests that the charter should be amended to permit practice of those principles which will save money and which will prevent loss. To this end it is recommended that the charter should be amended so that, when approved by council and the city attorney, bargain purchases can be made without any waste of time which advertisement for bids necessitates. Also that charter change be made so that appropriations for departments be made in December for the following year, instead of sometime in January, as is now the law."

MUNICIPAL PHOTOGRAPH AND BLUE PRINT PLANT.

A municipal plant for making photographs and blue prints is operated by the city of San Francisco for doing all the work of this character required by all of the departments of the city government. It occupies specially designed quarters on the roof of the new city hall and consists of an office, dark rooms, blue print room, photostat room, drying room and storeroom, all equipped with the most recent and approved devices.

An electric blue print machine in one continuous operation, prints, fixes, washes, dries and rolls blue prints and blue-line prints. For sun work, two large vacuum frames and the necessary washing tanks are provided. A special photostat machine, which was made to order for the department, has been of great value in the work of appraising the Spring Valley Water Company's properties, since by means of it copies could be made of many valuable data which otherwise would have been very costly to produce. This machine is also very convenient for reproducing engineering maps and drawings, enlarging or reducing them to any desired size. It has effected a great saving in the preparing of a new city map and block books for the assessor's office.

PHOTOSTAT ROOM.

At regular intervals photographs are taken of all construction work in progress for the city, which are preserved as records of progress and of the character of the constuction. Photographs and negatives are filed and indexed together with all desirable information descriptive of the work.

BLUEPRINTING ROOM.

DUMPING REFUSE AT OAKLAND.

As described briefly in Municipal Journal several months ago, the city of Oakland, Calif., disposes of its refuse by dumping it along a part of the water front, on an area which is enclosed with a levee at one point and by floating piles fastened end to end at another. City engineer Perry F. Brown writes us that the city is continuing this method of disposal, although for about eight months prior to April 1st they had beep prevented from dumping on the waterfront because of construction work that broke up their trestle leading to the dumping point. Up to that time they had covered an area of about five acres, which has now settled to such an extent that it is not more than three or four feet above high water. The city has started a new dump which is an extension of the old, and this will be raised so as to give a face eight or ten feet above high water, allowing for ultimate settling of the garbage. The city is now handling about sixty loads, or eighty tons, daily. To prevent nuisance from flies, the garbage and other refuse is to be covered with sand. Most of the covering will be done with a sand pump, but it will be necessary to supplement this with dry sand taken from an adjacent bank, for the reason that the sand pump so drenches the garbage that the wagons find the dump almost impassable. The sand covering can be applied at comparatively little expense.

The WEEK'S NEWS

Michigan Votes $50,000,000 for Good Roads—Railroad Administration Reduces Rates on Road Materials.—U. S. Public Health Service to Organize Cities for Disease Control—Water Powers in Maine to Be Studied by Commission—New Jersey Pension Bill Fails—Platoon Legislation in New York and Massachusetts—New York City's Flying Police—Cincinnati Loses Whole Fire Department—Manager Plan for Bristol, Va.—Boulder's Manager Resigns.

ROADS AND PAVEMENTS

Big Majority for Michigan $50,000,000 Road Bonds.

Lansing, Mich.—The voters of the state gave hearty approval, with a three-to-one majority, at the recent election to the proposed $50,000,000 bond issue for highway construction. The money will be used for a system estimated to involve 5,000 miles. It is designed to connect every county in the state.

Court Reduces City Additions to Contract Price.

Portland, Ore.—Holding that city officials had no authority, under the charter, to add to the contract price more than the actual cost of engineering, advertising and superintendence, and that in so doing the council exceeded its jurisdiction and to that extent the assessment is void, the supreme court at Salem modified the case of A. B. Irelan and E. E. Chapman, appellants, against the city of Portland. The suit was to cancel street assessment charges against certain lots of plaintiffs for the improvement of the street on which they abut. The appeal was from a decree for the defendants, dismissing the suit. The modification made by the supreme court is a reduction of the total cost of the improvement to $135,465.31, a proportionate part of which should be assessed against the plaintiff's property. The contest was on the grounds that the contract was not legally awarded and that the cost was excessive. The cost of the paving was $130,812.20, and to this the city added 5 per cent, or $6,537.11, to meet the cost of engineering, advertising and superintendence. The latter amount is reduced by the supreme court to $4,653.11.

Freight Rate on Road Material Reduced.

Washington, D. C.—The Railroad Administration has issued an order reducing freight rates on road building materials consigned to public officials. P. St. John Wilson, of the U. S. Bureau of Public Roads, sent out the following telegraphic notice: "Railroad administration has ordered reduction of 10 cents a ton on road building materials, effective May 1 to December 31, 1919." E. Guy Sutton, of Indianapolis, president of the National Association of Sand and Gravel Producers, spent nearly a month conferring with federal authorities over a simultaneous reduction of freight rates and prices on building materials. The reduction from published tariff rates on specified road building materials applies only when for use in federal, state, county, parish, township or municipal road work. The order authorizes all railroads under federal control to apply new rates on carload shipments of stone (broken, crushed and ground), slag, shells, chatts, cherts, sand and gravel shipped from May 1 to December 31, 1919, inclusive, when for road building or road maintenance and when consigned to and the freight thereon paid by federal, state, county, parish, township or municipal government. The reduced rate to be applied to such material shall be 10 cents a net ton less than the regularly published tariff rates in effect for the transportation of these materials for commercial uses at the time shipments move, but with a minimum charge of 40 cents a net ton, except that where the regularly published commercial rate is less than 40 cents a ton, then such regularly published rate shall apply. These reduced rates may be applied on shipments consigned as outlined above but in care of a contractor, provided the freight is paid by the government, and provided proper certification is made by the government through its properly accredited representatives that the shipments are for the use of, and the reduction in the rate will accrue to the government. The rates authorized are to be applied without publication in tariffs, account government property, but each railroad hauling such material is charged with the duty of seeing that the reduced rates are applied only on bona fide government material where the freight charges saved by the reduction will accrue to the government as indicated above.

SEWERAGE AND SANITATION

Sewer Rental System.

Roanoke, Va.—City council has passed a general sewer rental ordinance for the city. This action was made necessary for the recent purchase of the South Roanoke sewer system. The new ordinance fixes an annual rental of ten cents per front foot on all lots occupied by houses and having sewer connections. A commutation rental of sixty cents per front foot is also provided, those taking advantage of this getting perpetual use of the system under one payment. Unless the lot is occupied by a house the rental does not apply. The ordinance will not actually affect very many people now living in the city of Roanoke. There are only thirty-three houses in the South Roanoke annex on the annual rental basis, the others having bought permanent connections before the system was purchased by the city. The early sewer lines in the balance of the city were constructed and paid for entirely by the city and were placed on the rental plan. However, practically all property owners on these lines have already taken advantage of the commutation plan. There are, however, something like fifty unoccupied lots on these lines that will come under the new ordinance when buildings are placed thereon. All of the more recent sewer lines of the city have been constructed on the plan of shared first cost, the city paying two-thirds and the property owners paying one-third. This plan carries with it the right of permanent connections. In special instances, however, citizens by agreement have paid half the cost instead of one-third, this also carrying permanent connection rights. A great deal of the property served by the sewer lines in South Roanoke is not yet developed, while other property there will require sewer line extensions later on. The new ordinance is important from that standpoint. Rentals to be collected under the ordinance are now due. The city contracted to pay $19,135 for the South Roanoke system and has already paid $4,135 of this amount in cash. This brings the book value of the city's sewer lines to $351,881.39.

U. S. to Grade Cities on Venereal Control.

Washington, D. C.—The United States Public Health Service has launched a plan to bring about the active cooperation of the 730 cities of the United States having a population of 8,000 and over in the work of venereal disease control. Inquiries have been sent to approximately ten prominent citizens in each of these cities, who are requested to name the local civic organizations best equipped to bring together all local agencies in the fight against venereal disease. Such an organization will be designated by the State Board of Health and the U. S. Public Health Service, according to the consensus of opinion of these leading citizens. The local civic organization

selected will stimulate interest in the problem of venereal disease control in order to bring about the adoption of medical, educational and law enforcement measures advocated by the Public Health Service. It will seek to co-ordinate the activities of the various organizations already at work. It is hoped that in most cities this civic organization will be ably assisted by the city health officer. Each city will be graded from two to four times during the year on the basis of a possible 1,000 points, according to the action which the city has taken for the purpose of preventing the spread of venereal disease. It is planned that the proposed grading will be done by an officer of the Public Health Service, who will make a personal visit to each city for the purpose. The gradings of the 730 cities will be published and comparisons made between cities of approximately the same size.

During February there were ten additional clinics established in various parts of the country for the free treatment of venereal diseases by the Public Health Service in cooperation with municipal departments of health, making a total of two hundred such clinics in the United States. Reports recently received from forty-eight clinics show that during February there were 12,884 patients suffering with these diseases under their care. Of this number, 3,143 were admitted during the month. The reports also show that there were 643 patients discharged as cured. It is pointed out that many persons afflicted could not obtain treatment before the establishment of these free clinics. The outstanding features of the report of the month of February were as follows: 1. The increasing number of voluntary visits to the clinics in comparison to previous months is in diminution to the involuntary treatments. 2. The increasing number of patients being discharged as cured. 3. The constancy of clinic attendance.

STREET LIGHTING AND POWER

Electric Plant Census in Six States.

Washington, D. C.—The Bureau of the Census has given out some preliminary figures of the forthcoming report on electric light and power stations in the various states of the five-year period—1912-1917. These statistics cover only municipal and commercial plants, and do not include those operated by federal and state institutions and by factories and other establishments which generate power for their own use only. The figures do not take into consideration any idle plants or plants in process of construction. Statistics for six states may be summed up as follows:

The number of electric light and power stations in Alabama increased during the period covered, from 69 to 82, 10 of the 13 additional plants being municipal and three commercial. The total income increased from $1,257,720 in 1912 to $3,152,709 in 1917, or 150.7 per cent.; while the total expenses increased 195.4 per cent. Steam supplied the greater part of the primary power in 1912, but in 1917 56.3 per cent of the power was derived from water. The aggregate dynamo capacity in 1917 was 128,509 kilowatts, an increase of 425 per cent, as compared with 1912.

Georgia had 176 stations at the close of the period, as compared with 126 at its beginning, 40 of the 60 new establishments being municipal. The total income increased 75.1 per cent, the total expenses 63 per cent, and the aggregate horsepower 42.9 per cent. In 1917 the percentage of power derived from water was 59.8, as compared with 59.1 in 1912.

From 1907 to 1912 the number of establishments in Illinois decreased from 383 to 269, but by the close of 1917 they had increased to 303. Of the 34 new establishments in the period 1912-1917, 22 were municipal. The total expenses in 1917 were $37,921,833, and the gross income, $46,245,976, the quinquennial increases being 61 per cent and 53.9 per cent, respectively. Steam supplied the 93.9 per cent of the horsepower in 1917 and 93.7 per cent in 1912. During the period the total horsepower increased 62.1 per cent.

The 325 light and power stations in Iowa in 1917 brought in a gross income of $10,240,235, while the total expenses were $8,669,600, the increases over 1912 being 132.4 per cent and 160.4 per cent, respectively. Water supplied 62.9 per cent of the primary power in 1917; but in 1912, when there were only 223 plants in the state, 87.4 per cent of the power was generated by steam. This change was due to the completion of the immense plant on the Mississippi River with dam and power house at Keokuk, Iowa. The increase of 815.3 per cent in the output of current is also due to the starting up of the Mississippi River Power Co.'s plant, which distributes current not only in Iowa, but in several adjoining states.

The statistics for Louisiana show an increase from 50 to 85 stations during the period 1912-1917, 22 of the 35 new ones being commercial plants. The total income in 1917—$3,244,789—represented an increase of 42.4 per cent while the total expenses—$2,459,868—increased 53.4 per cent since 1912. Steam and internal combustion engines supplied the greater part of the horsepower throughout the period, no water-power plants being reported.

Maine had 93 electric light and power plants in 1917 as compared with 79 in 1912. Twelve of the fourteen establishments represented in the net increase were commercial, and 2 municipal. During the five-year period the total expenses increased 52.4 per cent, and the gross income 49.6 per cent. The increase in horsepower during the period was only 9.5 per cent; and water supplied 78 per cent of the power in 1912 and 76.9 per cent in 1917.

Engineer Reports on Gas Quality.

Syracuse, N. Y.—The report of Prof. A. R. Acheson, consulting engineer in the bureau of gas and electricity, on his investigation into the quality of gas furnished to consumers by the Syracuse Lighting Company has been submitted to council. Consumers have been misled in reports that the company pumps air into its mains in quantities sufficient to affect the quality of gas, Professor Acheson reports. The company uses blower pumps to pump gas to containers in various sections and it uses air to restore iron ore, through which the gas is passed to remove sulphur. But tests made by Professor Merritt R. Grose of Syracuse University, supplemented by records kept by classes at the university, showed that the amount of oxygen in the gas on that date was but 0.3 per cent. It had been shown in previous tests to run as high as 0.7 per cent, but never was there enough to substantiate the charge of pumping air into the mains. Sixty-one tests made by Professor Acheson showed the gas to conform to the legal requirement of 585 B. t. u. per cubic foot for heating purposes. The quality of gas had been poorer during the war because of the shortage of oil and many complaints were due to this fact and many others to inaccuracies in meter readings extending over a period of several months. The gas is all right now, substantially the same as it has been for the past four years, and the company has in hand the removal of the causes of complaint about inaccurate reading of meters, the report stated.

Water Power Commission for Maine.

Augusta, Me.—A special commission has been created by the state legislature to investigate the water power resources of development. The commission is to take over the water resources data of the Public Utilities Commission, and an appropriation of $40,000 has been authorized to cover the cost of the investigation. A report is to be made to the legislature of 1921 through the governor and council, and among the subjects to be considered are the flow of rivers and their drainage areas, storage facilities existing and potential, state rights in developed and undeveloped water power, transmission of energy outside the state, and the private versus state development and ownership of water powers. The commission, which is to be called the Maine Water Power Commission, receives authority to employ engineers and other assistants and is to be assigned quarters in the state capitol here. It is to be composed of ten members, including three members of the last legislature and one delegate each from the Maine State Board of Trade, Maine State Grange, Maine State Federation of Labor and Savings Bank Association of Maine. Commissioners not members of the state legislature are each to receive $5 per day while engaged in commission work, and all commissioners are to be allowed expenses connected with these duties.

FIRE AND POLICE

Police and Firemen's Pension Bill "Dies."

Trenton, N. J.—Firemen and policemen throughout the state were disappointed to learn that their bill for the reorganization of the police and firemen pension funds, assemblyman Seigler's bill No. 297, failed to get through the Senate and is dead. The hope had been that the Siegler bill was among the bills that got through in the big rush just before final adjournment. The pension funds of the

firemen are in a bad way and conferences have been hurriedly called to see what can be done to tide over the situation until the next legislature meets next January and affords permanent relief. The Seigler bill was opposed by speaker Pierson, who denounced it as a bad piece of legislation calculated to load on the taxpayers new burdens in connection with police and firemen pensions. Speaker Pierson had a bill that had been evolved by the Pierson Pension Commission, but the organized firemen and policemen would not stand for the Pierson methods of reorganizing the bankrupt firemen and police pension funds. They prepared the Seigler bill, which was to make the taxpayers stand for a large part of the burdens connected with the job of putting the funds on a sound basis. The bill, which has already been explained in these pages, was passed by the Assembly.

Legislation for Three Platoons Passed.

Albany, N. Y.—The state assembly has passed the firemen's three platoon bill by a vote of 119 to 13. A referendum rider to appease cities now financially overburdened removed practically all vestige of opposition. As passed, the measure provides for a three-platoon system in any city of the state when 10 per cent. of the voters approve.

New York's Police Aviation Branch.

New York, N. Y.—Captain Granville A. Pollock has been appointed major in charge of the aviation branch of the police department. This was done at a special meeting at which a uniform was adopted and plans for work discussed. The new uniform, it was said, would be an innovation and it would be only a short time before the twenty members of the new service are supplied. In a statement given out after the meeting it was said that the service would be of great value in time of a big fire or other catastrophe. It was also said that there would be developed aerial traffic regulations to insure the safety of those in the air and those below. Pursuit scouts will enforce traffic rules. "The chief duty of the pursuit scouts will be to head off negligent aviators from prohibited areas," the statement said. "The scouts will in all probability be armed with machine guns from which traced bullets will be fired at air pirates. In addition the department is to have flying boats for sea patrol. There are already more than 150 applications for entrance into this new field of police activity."

Two-Platoon Legislation Passed.

Boston, Mass.—The House has passed to be engrossed the Senate bill for a two-platoon system for firemen. The system is to go into effect in such cities and towns as accept it by referendum.

Cincinnati Fire Department "Resigns" in Body.

Cincinnati, O.—Following the refusal of city officials to reinstate four members who had been dismissed for joining the local union of firemen, most of the men in the department resigned their positions. Resignations were handed in, and accepted, by 434 men, leaving only 98, including chief Houston and the marshals. The Home Guard is taking the place of the men until new men can be trained for their permanent duties. The crisis came after the persistent refusal following a petition signed by the firemen. Safety director John R. Holmes and mayor Galvin claim that one of the rules of the fire department would be violated if the union were recognized or if any man in the department were allowed to join it, the rule forbidding the members of the fire or police departments from joining "any organization which might tend to interfere with the discipline or control" of the department. The men insist that their organization has no such effects. S. A. Fink, first vice-president of the International Fire Fighters' Association, gave out the following statement:

"All this talk about the firemen 'walking out' or 'quitting their posts' emanated from Mayor Galvin and Safety Director Holmes. It is they, and not the firemen, who have been forcing the issue. At no time during the firemen's efforts to secure the reinstatement of the four discharged firemen have we said anything about 'deserting' our posts or 'quitting' the fire department. No such action was originally considered. This suggestion has in each and every case come from the city hall. As a matter of fact, we have repeatedly stated to the city officials and to the public in our newspaper interviews that the constitution of the Firefighters' Association forbids 'strikes' or 'walkouts.'

"For years the Cincinnati firemen have been kicked around from pillar to post, been made the footballs of politicians and used for partisan purposes. Under the system created in the Cincinnati fire department it has become an agency to punish such members who defied the bosses or reward those who did their bidding, the customary method being to transfer members from one station to another. The 'club' has been wielded over the firemen's heads for years, their spirit of independence broken and their manhood suppressed, so that when a final effort is made to take from them the last vestige of citizenship their wrath and indignation knew no bounds. They feel that the time has come for them to assert themselves and to be either men or puppets.

"The firemen realize now, and have realized for some time, that they owe a certain duty to the public. They have no desire to take any action which might jeopardize life or property or incur public censure or disfavor. They feel that they have taken a dignified and honorable course and were acting within their rights as citizens of the United States. The mayor and safety director, backed by their civil service commission, have seen fit to disregard the public expression in favor of the firemen's right to join a labor organization, victimized and punished four of the firemen for the alleged violation of rule 55, refused to reinstate them and served notice on all members of the department that it is their intention to remove all members who have joined the Firefighters' Association. In other words, each and every fireman who joined the Firefighters' Association will be removed sooner or later.

"The firemen now have but one alternative left—they must either wait to be 'thrown out' or resign honorably in a body."

Fire Chiefs Become Deputy State Marshals.

Charleston, W. Va.—Fire chiefs of the state are to be pressed into service as deputy fire marshals, according to a plan announced by state fire marshal John S. Horan. The purpose of this action is to expedite investigations of fires of suspicious origin and to bring about cooperation between the cities and towns of the state in the matter of bringing to justice pyromaniacs or firebugs, and for the betterment of the fire laws of the cities and state. This course has been decided upon after months of study of the situation in the state, where numerous cases of arson brought before the courts resulted in failures in convictions because no authority could prosecute the case and the fire marshal's office would have to send a deputy entirely unacquainted with the situation to represent the state. The fire marshal has been handicapped by a small force of deputies, and the natural growth of the state has gone far beyond its power to cope with the situation. In making the fire chiefs deputy marshals, Mr. Horan says, the fire chief would then have not only the power of the municipality back of him, but the state as well, and would not have to wait on the state officials to start an investigation, but could start in immediately and in many cases apprehend the guilty ones before they would have time to get away or try to hide their crime. The new plan of Mr. Horan's will not cost the state anything additional, as the fire chiefs are to perform the deputies' duties without compensation, and their work will be confined to the city or town under which they hold office.

GOVERNMENT AND FINANCE

Court Declares Bristol, Va., Voted for Manager.

Bristol, Va.—Following an election on the city manager plan the city was undecided as to whether the proper majority of voters actually approved the proposition. Henry Roberts, attorney for J. A. Goodpasture and others, upon whose petition the recent election was called, appeared before judge Floyd H. Roberts, of the Corporation Court, and asked an order declaring that the election favored the city manager plan. The judge finally granted the order as asked. Attorney Roberts cited the decision of the Supreme Court of Appeals of Virginia of September 9, 1918, in the case of the city of Roanoke against Elliott and others, in which case the Supreme Court dismissed a writ of error, and after which the city manager government assumed charge of the government and affairs of the city of Roanoke, Va. Mr. Roberts called attention to the fact that in the Roanoke election there were 4,456 qualified voters in the previous June election and that only 1,470 votes were cast in the election in May, 1918, on the pro-

posed change in government and that 368 of these were against the change and 1,102 in favor the change, and that the Circuit Court of the city of Roanoke held that the 1,102 votes so cast in favor of the change of form of government constituted a majority of electors of said city "according to the true intent of the constitution of Virginia and of the said act as amended by act approved March 14, 1918." The Supreme Court stated that "the acts of 1914 and 1916 each provided that a majority of the qualified voters authorized to vote at such an election must vote for the proposed change in order to secure its adoption. The act of 1918, however, changed the language of this clause, and followed the language of the constitution requiring the election to be carried 'by a majority vote of the qualified electors.'" The Circuit Court of the city of Roanoke entered an order declaring "that pursuant to the will of the people of the said city, as declared by a majority vote of the qualified electors voting in the manner prescribed by law, the existing form of municipal government of said city be, and the same is, hereby changed to that known and defined as the 'City Manager Plan.'" In the Bristol election there were 696 qualified voters in the last June election, and there were 107 votes cast against and 278 votes cast in favor of the change to the city manager plan. Mr. Roberts claimed that the decision and result in the Roanoke case is decisive of the Bristol case. The fact that the law had been amended since the election on the modified commission plan was held in Bristol in 1915 was not generally known in Bristol.

City Manager of Boulder Resigns.

Boulder, Colo.—City manager Edward Oscar Heinrich will resign his position as head of the government. He asked the city council to be relieved of his duties on June 15. Mr. Heinrich will go to San Francisco to take over the practice of the late Thomas Kytka, the most famous and successful criminologist on the Pacific Coast, and one of the best known experts in this field in the country. Mr. Heinrich's home will be in Berkeley. He will have the chair of criminology in the university of California and will give a lecture course in the science at the state university this summer. Before becoming city manager of Boulder, Mr. Heinrich had the reputation of being the second best known criminal expert on the Pacific Coast. He had private laboratories in Tacoma, and was widely known throughout the Pacific states as an expert on criminal jurisprudence. He was city chemist of Tacoma, city engineer of tests, and criminology expert and investigator for the district attorney. He also delivered a number of lectures in the university of California on criminology. He organized the police department of Oakland and was at its head when he was chosen city manager of Boulder on January 25, 1918. He did a great deal of original research work along criminal lines and was consulted in some of the big cases on the coast. Since Mr. Kytka's death in January many men in official life and others who were formerly acquainted with the work done by Mr. Heinrich have written to him urging that he return to the coast. Mr. Heinrich said that he paid little heed to suggestion that he return to the coast states until a fight against him became warm. The visits of a committee asking that the council call for his resignation and other attacks on him turned his thoughts to again entering private life. The council unanimously refused to grant the request of the committee of citizens which asked for Mr. Heinrich's displacement. Another committee as strongly asked that he be retained in office. The refusal of the council in October and again recently to grant him a vacation and rest period hastened his determination to give up the work. Perhaps the greatest single achievement of the municipality under the management of Mr. Heinrich was the placing of the water supply system on a firm financial basis. When the present administration went into office there was a bonded indebtedness on the water system of about $363,000, with but $20,000 in the fund. In his letter to council, Mr. Heinrich says:

With the payment today of Series No. 8 water works bonds in the sum of $65,000 with interest for the last semi-annual period, there has been brought to a conclusion what might be aptly termed the first phase of the development of the City of Boulder under the commission-manager form of government.

During the past fourteen months that I have been your manager, during which time departmental affairs have been brought to a state of organization contemplated under the charter, there have been accomplished through the active co-operation and support of your honorable body, a number of interesting and fundamental things.

The water department has been placed on a sound financial basis. On its physical side, progressive work has been done on the distribution system, on the transmission system, and on the storage system in the preparation of a proper foundation for further work in the improvement and the supply as to quality, quantity and cost of delivery.

In other financial matters of the city's affairs a most distressing war period of limited purchasing power of public funds has been passed through successfully. In connection therewith, for the first period of our activities which are ended, and of which I am now speaking, a budget was prepared within which the city was able to stay. Further, the entire finances of the city have been reduced to the form of a comprehensive, comparative and segregated annual budget.

Still further associated with and bearing directly on the city's finances, a simple yet comprehensive scheme of accounts has been installed in the department of finance and record which is uniform with the system maintained in the most progressive of our American cities. It includes as its distinguishing feature the control of all municipal accounts in a general ledger maintained in connection with a general journal, both heretofore lacking.

In so far as general conditions would permit, important legislation has been enacted, materially extending the powers of the city in the matter of civic growth and physical improvement. The department of public service has been encouraged to grow from a mere routine organization occupied wholly with maintenance to a planning organization concerned with maintenance and future development as well. Public health and public welfare have each in their respective departments been fostered in accordance with the expressed will of the people as it may be interpreted by a study of our municipal charter.

Remaining departments of our city have received their due attention and encouragement. I am proud of the accomplishments to date, yet I chafe under the restraints under which I must work that is imposed by the fact that progress can be made in no faster than the shrunken purchasing power of our funds will permit. The thought necessary in all of these matters has been wearing and I find myself today mentally fagged and physically tired. The position of city manager is a position which has no hours. It is absolutely impossible to get away from the work and I have come to believe that a rest is necessary and highly desirable if a high standard of personal interest and application is to be maintained.

This was suggested to your honorable body in the first instance last October when a short period of relief was asked for and deemed by you to be inexpedient. I have again recently sought the views of several of the council on the question of rest and recuperation and have been advised that such a favor is still inexpedient. We are taught and understand the story of dying for our country, but municipal appreciation has not yet reached the point which justifies wearing out or dying for a municipality. In order that I may secure complete relaxation from official duties and the change of scene which is desirable for refreshment of nervous energy, I shall at an early date submit to your honorable body my resignation as city manager, with the desire to be relieved on or about June 15.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Crutch in Pavement Hole—Liability of City for Damages. (Mo.App.) A city is not liable for failure to make special provisions to eliminate the danger of persons traveling along a sidewalk upon crutches or canes, in putting them into holes or crevices unavoidable between stones or boards.—Wilkerson v. City of Sedalia, 205 S. W. 877.

Right of Egress from Private Property—Obstruction by Railroad. (Ill.) The right to travel the streets is one which the public has a right to enjoy, but the right to use the street for ingress to and egress from private property is private, and the property owner may maintain an action for an interference therewith.—Gibbons v. Paducah & I. R. Co., 120 N. E. 500.

Where railroad embankment crossed two north and south streets and four east and west streets in immediate vicinity of plaintiff's property without leaving means of ingress and egress to and from his property to the principal part of the town across the embankment, there was an interference with plaintiff's private rights for which the railway was liable.—Id.

NEWS OF THE SOCIETIES

April 25-26.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, Logan Hall, West Philadelphia, Pa.

May 6-8.—NATIONAL FIRE PROTECTION ASSOCIATION. Annual convention, Ottawa, Can. Secretary, Franklin H. Wentworth, 87 Milk St., Boston, Mass.

May 13-14—AMERICAN ASSOCIATION OF ENGINEERS. Annual meeting, Chicago, Ill. Secretary, C. E. Drayer, 29 South LaSalle St., Chicago, Ill.

May 14-15.—LEAGUE OF TEXAS MUNICIPALITIES. Seventh annual convention, Sweetwater, Tex. Secretary-treasurer, Frank M. Stewart, University of Texas, Austin, Tex.

May 19-24.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Atlantic City, N. J. Secretary, T. C. Martin, 29 W. 39th St., New York.

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

June 17-20.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, St. Paul-Minneapolis. Secretary, Charles W. Hunt, 33 W. 39th St., New York, N. Y.

June 23-26. — SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, Coates House, Kansas City, Mo. Secretary, E. L. Fulkerson, 617 Washington St., Waco, Tex.

June 24-27. — AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University.

June 24-27.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

National Conference on City Planning.

The eleventh annual Conference on City Planning will be held May 26 to 28 at Niagara Falls, and Buffalo, N. Y., under the auspices of the American and Canadies cities and towns of the Niagara frontier. A temporary program has been announced by the secretary, Flavel Shurtleff, 19 Congress street, Boston, Mass.

On Monday and Tuesday the Conference will meet at Niagara Falls. Following registration and an automobile tour in the morning, luncheon will be held at the Niagara Falls Country Club, at which there will be a twenty-minute address on town planning topics of general interest. At the first conference session, which will be held in the afternoon, under the general subject head of "Town Planning Problems of Industrial Towns," John Nolen, Cambridge, Mass., will discuss Niagara Falls, N. Y., and Warren H. Manning, Boston, Mass., will talk on Birmingham, Ala At the evening conference, Frederick L. Olmstead, Brookline, Mass., will deliver the presidential address on "Planning of Residential Subdivisions," and other speakers on various phases of the subject will follow.

The third conference session, on Tuesday morning, will take up "The Location of Railroads on the City Plan." This session will be in charge of Nelson P. Lewis, New York. In the afternoon, the subject will be "A Regional Survey and Plan," this session to be in charge of Thomas Adams, Ottawa, Canada, and Mr. Donald. The same subject will be discussed at the evening session.

On Wednesday, all sessions will be held in Buffalo. At the luncheon, there will be a twenty-minute address on "Residential Zoning," and this will also be the subject of the afternoon session, at which Arthur C. Comey, Cambridge, Mass., will speak. The final session will be in charge of George C. Rice, Buffalo, and will deal with "Civic Centers."

National Electric Light Association.

Six committees of the National Electric Light Association met recently in Chicago to work out plans and programs. The committees were the lighting sales bureau, the power sales bureau, the merchandising committee, the executive committee of the Commercial Section, the overhead-lines committee and the safety and accident prevention committee. A feature of the activities of the lighting sales bureau will be a fifteen-thousand-dollar exhibit, which will be prepared in conjunction with the lamp committee, and partly at the expense of the lamp manufacturers.

Some of the reports which will be submitted by the lighting sales bureau are on the commercial aspects of lamp apparatus, electrical advertising, outdoor lighting, residence lighting, lighting of public buildings and store lighting. There will also be a paper on probable causes of decreases in revenue and methods of remedying these conditions. W. A. Durgin, Chicago, will make an address and give a demonstration on industrial lighting. Discussions from the floor rather than set papers will prevail in this meeting. The topics to be discussed include electrochemistry; the effect of the war on isolated-plant costs; electric furnaces for the three purposes of melting steel, melting non-ferrous metals and heat-treating metals; electric welding; desirability of correcting power factor in customers' installations, and industrial electric trucks and tractors. The efforts of the merchandising committee will be confined mainly to bringing its 1915 report up to date. Important features of the report will be data on a uniform accounting system, discussions of merchandising profit and advertising by small stations. The principal topic before the overhead-lines committee was inductive interference. The safety and accident prevention committee devoted considerable time to the National Electrical Safety Code.

The convention is to be held during the week of May 19 at Atlantic City, N. J.

PERSONALS

Brennan, Capt. C. B., has been discharged from the Army and has resumed his position as city engineer of Kenosha, Wis. P. J. Hurtgen, who was city engineer during his absence, has been appointed commissioner of public works.

Borchers, Charles M., has been elected mayor of Decatur, Ill. He was mayor about nine years ago. John F. Mattes, Harry Ruthrauff, Alex Van Praag and J. W. Montgomery were elected commissioners.

Ball, Charles B, chief sanitary inspector of Chicago, Ill., has left Chicago for France. He is to give a course of instruction in housing and community planning for the department of citizenship of the Army Educational Commission, Y. M. C. A.

Rundle, Frank, has been elected mayor of Clinton, Ill. The new commissioners elected were H. B. Lunh, Harry Macon, Amos Bordner and John McKinney.

Troyer, Daniel J., mayor of Goshen, Ind., died recently of influenza.

Wadman, John L,, has been elected mayor of Independence, Kan.

Gardner, Robert, assistant superintendent of the water department, Lowell, Mass., has been appointed superintendent of the department, succeeding Robert J. Thomas.

Phelps, H. E., assistant sanitary engineer, United States Public Health Service at Petersburg, Va., has resigned and is now highway engineer for Moreland and Bennett Counties, at Pine Bluff, Ark.

Kittredge, Capt. Harry C., Engineers, U. S. A., has been appointed superintendent of city construction, Rochester, N Y., following his discharge from the service.

Governor Sproul, of Pennsylvania, recently announced the appointment of George H. Biles as assistant highway commissioner, Col. William D. Uhler as chief engineer of the state highway department, and Joseph W. Hunter as township commissioner. Highway Commissioner Sadler has appointed Howard W. Fry, of Lancaster, secretary of the department, and M. H. James, of Harrisburg, chief of the bureau of information.

The appointment of Mr. Biles recognizes his services during war times, when, despite handicaps, the department accomplished far more work than had ever before been put through in a similar period. Mr. Biles was named second deputy highway commissioner

in 1915. He had complete supervision of maintenance over all state highways and state-aid roads. On Feb. 1, 1918, he was appointed acting chief engineer, and in addition to his supervision over maintenance was in charge of all construction work.

Before coming to the department in 1905, when he was appointed chief draftsman, Mr. Biles saw extensive service as an engineer in the department of public works, city of Philadelphia, where, in 1904, he qualified for principal assistant engineer. He had been with the state department less than a year when from chief draftsman he became division engineer in charge of the central and a portion of the eastern counties of the state, taking up the early experiments on bituminous road materials. He designed and constructed the famous "Lewistown Narrows" model road, the first built under the Sproul Highway act. He also designed and built the river drive out of Harrisburg. He was appointed assistant to the chief engineer Dec. 1, 1912, and in 1913 was put in direct charge of all maintenance.

Col. William D. Uhler, who recently returned from army service, is one of the leading road engineers in the country. He was appointed chief engineer of the department April 7, 1915. Mr. Uhler secured a leave of absence from the department early in 1918, and was named major in the motor transportation corps. Very shortly afterward he was promoted to be a lieutenant-colonel and as such, had charge of the operations division. He also represented the War Department on the United States Highways Council, and acted as assistant to Major-General George Goethals on all highway matters. Col. Uhler engaged in railroad work from 1890 to 1903. In 1908, after four years as county roads engineer for Caroline county, Maryland, Col. Uhler was put in charge of surveys and plans for the Maryland state roads commission, and later in charge of maintenance. In 1912 he resigned to become principal assistant engineer of the Philadelphia bureau of highways. He was appointed chief engineer of the state highway department by Governor Brumbaugh.

Under the administration of Governor Sproul it is planned to create a bureau which will be of service to the hundreds of townships of Pennsylvania. The re-organization of the highway department creates the position of township commissioner. Joseph W. Hunter, township commissioner, is widely known throughout Pennsylvania. Since 1890 he has been actively engaged in his profession of civil engineering and surveying, turning his attention directly to the improvement of county roads. He was appointed state highway commissioner in 1903 and was re-appointed in 1907. In 1911 he was named first deputy state highway commissioner by Governor John K. Tener, and this position he held until now.

The new secretary of the department, Howard W. Fry, was chief clerk of the department since his appointment in 1914. He is well known throughout the state. For twelve years prior to his connection with the state highway department he was a clerk in the office of the secretary of the commonwealth. Mr. Fry is a member of the Lancaster city council. Before coming to Harrisburg in 1902, he had an extensive legal training.

M. H. James, chief of the bureau of information, came to Harrisburg three years ago as secretary of the William Penn Highway Association. He was in charge of the successful 1918 campaign on behalf of the $50,000,000 highway bond issue.

INDUSTRIAL NEWS

Wallace & Tiernan Co., Inc., 349 Broadway, New York, N. Y., has issued a striking and interesting folder entitled "Ready!" It shows views of water pumping, purification and laboratory trucks used in war service. The conception, design and construction of these trucks was one of the war contributions of the technical staff of the company. These units were always ready for action and accompanied the troops to supply safe and pure water from grossly polluted streams. Liquid chlorine was used for sterilizing.

Concrete Distribution by Chutes.

A new catalogue on "Concrete Chutes and Equipment," just issued by the **Ransome Concrete Machinery Co.,** of Dunellen, N. J., is practically a 50-page treatise on the subject of concrete distribution by chutes. It has been prepared with the particular purpose of enabling the contractor or engineer to lay out a complete concrete plant without the necessity of referring to various catalogues and hand books. As such it forms an interesting and helpful presentation of the standardized methods employed in connection with Ransome equipment in the distribution of concrete. Not only does it show a wide variety of equipment and applications, but the many plans and views of complete plants which are introduced assist materially in picking out the arrangement that will best fit the needs of a particular job. Copies are for free distribution to those who ask for Bulletin No. 200.

Lead and Zinc in 1918.

The domestic mine output of lead and zinc decreased in 1918, according to C. E. Siebenthal in a statement just issued by the U. S. Geological Survey, Department of the Interior. The lead and the recoverable zinc of ores mined was approximately 563,000 tons and 627,000 tons as compared with 651,156 tons and 711,192 tons in 1917. The refined lead ouput of smelters and refineries was 645,000 tons against 612,214 tons in 1917, and the antimonial lead output was 22,000 tons as against 18,647 tons. The lead available in the United States is 540,000 tons as against 515,258 tons in 1917. The output of spelter from domestic and foreign ore was 525,600 tons compared with 669,573 tons in 1917. Spelter from foreign ore decreased to 23,300 from 84,976 tons in 1917. The apparent domestic consumption of spelter was 440,000 tons compared with 413,984 tons in 1917. The consumption figures of both lead and zinc include the metal shipped abroad for use of the American Expeditionary Forces. The average price of lead at New York was 7.6 cents a pound, and of spelter at St. Louis 8 cents a pound.

The American-La France Fire Engine Co., Inc., Elmira, N. Y., has just published a new and very complete catalog which is devoted exclusively to "Safety First" devices. All of the articles in this catalog have been carefully designed and tested. A copy of this catalog will be mailed upon request.

The Lime Association, Mather bldg., Washington, D. C., will hold its first annual meeting in Pittsburgh, June 18 and 19. Headquarters will be at the William Penn Hotel. A large attendance is expected.

Exhibits at Fire Convention.

Secretary James McFall, of the International Association of Fire Engineers, has sent out bulletins to manufacturers and dealers in fire apparatus and equipment. The convention will be held in Kansas City, Mo., June 24-27. The exhibits will be displayed in the city auditorium, one of the largest buildings of its kind in the country. Chief Frank G. Reynolds, of Augusta, Va., is chairman of the exhibit committee.

CIVIL SERVICE—STATE OF NEW YORK

Open competitive examinations for the following positions in the state service will be held May 24, 1919. They are open to non-residents. Those interested should apply before May 12 to the State Civil Service Commission, Albany, N. Y., specifying the position.

162. **JUNIOR ASSISTANT ENGINEER** (Civil), Grade 1, State Engineer and Highway Departments. $1200 to $1440. Minimum age, 20 years. Subjects of examination and relative weights: Problems in applied mechanics and mathematics, including surveying, elementary structures and hydraulics; questions on surveying and construction practice, and on materials of construction, 3; experience, education and personal qualifications, 2.

172. **BRIDGE DESIGNER,** Public Service Commission for the First District. $1501 to $2100. Applicants must have had at least five years' practical experience in drafting, designing or constructing structural steel and bridge work. Graduation in engineering from a school maintaining a standard satisfactory to the Commission will be accepted as two years of the required experience. Subjects of examination and relative weights: Questions on graphical and analytical determination of stresses, and the design of trusses and girders, foundations, bearings, etc., 6; experience, education and personal qualifications, 4. For part of the examination applicants may use tables and books of reference as desired. Time allowed for the written examination, 8 hours. Appointments are usually made at the minimum salary, with opportunity for subsequent increase.

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI NEW YORK, MAY 3, 1919 No. 18

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Editorial Notes 319
Air Patrolmen—Garbage Utilization by the Army—State Roads Without Bonds.

South Norwalk's Street Lighting System (Illustrated).... 320
This city completed last fall the installation of a system of street lighting, using lighting fixtures designed especially for this city and ornamental poles, which also carry wires of private corporations; the whole financed from the earnings of the municipal electrical works.

The Army's Utilization of Camp Wastes (Illustrated)..... 323
Conclusion of article, giving data and describing methods by one who was directly connected with the work. F. C. Bamman.

Lighting Plant of St. Charles..... 325
Profitable municipal operation by a small Illinois city.

Prices of Paving and Paving Materials..... 326
Some figures comparing conditions during the past six years in the Middle Atlantic states, collected by William A. Howell; also a comparison by Henry Maetzel of prices in Columbus, Ohio.

Keeping Truck Costs..... 328
A standard system developed by the Truck Owners' Conference.

News of the Societies..... 329
Problems Cities Are Studying with Experts..... 329
Industrial News (Illustrated)..... 330
Personals 330
Legal News—Notes of Recent Decisions..... 332
Contract News 19

AIR PATROLMEN.

Possibly few cities will at once follow New York's example and organize aviation branches of their police departments, and yet it is apparent that air patrolmen may soon become necessary, and rules of the air which they will enforce for the safety of aviators and of those on the ground below. Aviation robberies may take the place of automobile robberies, and could even more easily elude pursuit unless they could be followed. As aids to the fire department, aeroplanes have already proved their value, and their practical use in many fields may develop before we realize it.

GARBAGE UTILIZATION BY THE ARMY.

Burning garbage and other refuse is undoubtedly the most sanitary method of disposing of it. It is also perhaps the most expensive of those in common use, and destroys many matters that could be recovered and utilized. The army has in the past used incineration almost if not quite exclusively for disposing of garbage at its barracks, forts, hospitals and other points of occupancy, probably because this matter has been in the charge of physicians, and they are, as a class, temperamentally inclined to consider sanitation as the sole consideration. From 1900 to 1907 there were, our records show, 97 incinerators built in the United States, and 30 of these were built by the army and navy. Altogether they have installed more than fifty plants.

But with the infusion of civilian blood into the management of army matters in 1917, and the asking of advice from experts and business men, incineration was entirely abandoned for utilization; with the result that, directly and indirectly, millions of dollars were saved, and pork and glycerine produced to meet an urgent need. And Mr. Bamman says, in his article last week and this that there is nothing to indicate that this gain has been offset by any injurious effect upon the health of any one, in camp or out.

Conditions in camps are vastly different from those in cities, and because utilization succeeded from apparently every point of view in the one is no certain indication that it should be adopted by all municipalities. But it has at least been demonstrated that the system is feasible and not detrimental to public health, and that it should be considered in every study of the problem of waste disposal by our cities.

STATE ROADS WITHOUT BONDS.

The state of Vermont has introduced one unusual feature in its road work, in that it has issued no bonds for this purpose and contemplates issuing none. M. E.

Shedd, chief clerk of the highway department, writes us: "Vermont has always paid for road work as it was finished, and for a number of years has paid special attention to maintenance. This policy will be continued."

Although no bonds are to be issued, the state will have available this year nearly a million and a quarter dollars for road construction, of which $622,650 is state appropriation, $125,000 is raised by a state highway tax, $100,000 has been voted by towns, and $362,650 is the federal aid apportionment. In addition, there will be $645,000 obtained from automobile registrations, etc., and from towns.

There are 15,000 miles of road in the state, and 4,300 miles of this are included in a state highway system; and about 2,000 miles of this system has already been improved with gravel.

SOUTH NORWALK'S NEW STREET LIGHTING

Lights and Fixtures Designed Especially for This Installation, Supported on Ornamental Poles That Also Carry Wires of Private Companies and of the Municipal Fire and Police Telegraph.

Just before the United States entered the war, South Norwalk, Conn., had started work on an extensive system for combining an ornamental street lighting system with wire-supporting poles to occupy about two miles of its principal streets. The installation had reached such a stage that work upon it had to be continued regardless of the great difficulties brought on by the war, and the construction was finished last fall. The lighting service actually became operative last summer, but the installation was not entirely completed until early in October.

The system consists of 143 poles, each pole supporting two ornamental lighting brackets and also carrying the wires of the Connecticut company, the Connecticut Lighting and Power Company, and the Postal Telegraph and Cable Company; also 53 poles carrying wires only. A part of the cost was paid by these companies, but the total cost, which is expected to reach about $40,000, has been wholly financed by the profits of the electrical works without a cent from taxation, the public treasury or other source.

Preliminary to preparing the final plans and while getting the complicated official machinery of the city and state in operation and favorable adjustment, much time was devoted to studying various types of ornamental street lighting, visits being paid to cities in the states of New York, New Jersey, Pennsylvania and the Central West as far as Detroit, Gary, Ind., and Chicago, and to a number of places in Canada by one or all of the electrical commissioners or by Albert E. Winchester, the general superintendent of the electrical works. Descriptions from more remote places were studied, but no type of ornamental lighting was found that would properly solve all the problems and conditions peculiar to South Norwalk ,in view of the necessity for extreme economic operation, extensiveness of the system, and the complex aggregation of overhead wires which had to be provided for. Ideas so obtained were utilized, but a complete new system was evolved by the collaboration of the General Electric Company's illuminating engineers and experts, D. M. Diggs, C. A. B. Halvorsen, Jr., and W. D. Jennings, with superintendent Winchester.

The installation, considered by experts to be one of the finest specimens of modern standard steel pole line construction in existence, carries the wires of two electric light and power systems, one electric street railway, one telegraph company, and the municipal fire and police telegraph systems. It was installed under the provisions and requirements of the Connecticut Public Utilities Commission. Of the 196 steel poles, 143 serve the double purpose of carrying wires and also twin lamps suspended from curved brackets, making a total of 286 lighting units on the nearly two miles of streets.

THE POLES.

The tubular poles consist of three extra heavy pipe sections decreasing in size and swaged into each other, with a base of cast iron and bracket castings of the same material, while the cross-arms carrying the wires are of wood brought from the Pacific Coast. The setting of the poles was one of the most important and exacting as well as difficult details of the work; this being due not only to their length, which was 35 feet, and their great weight, but also to the continuous danger involved in having to erect them among the existing wooden poles and wires, which had to remain intact so as to keep the several electrical systems in continuous operation. Each pole was set with a surveyor's transit, due allowance being made for strains of the trolley span wire. The poles were set in solid concrete foundations with their bottoms six feet below the surface and resting on metal plates imbedded in the earth and surrounded by charcoal, for the double purpose of securing positive footing and ample electrical grounding for both rigidity and public safety from stray currents.

After the new poles had been set, all wires transferred most carefully to them from the old wooden poles, and finally these latter, more than two hundred in number, were removed. All this was done without any accident of consequence, although the wires contained electrical currents ranging from 220 to 2300 volts. The poles were painted a dark bronze green, with a broad band of white which catches the light rays at a plane close to the lamps and adds to the illuminating effect. The wires are carried a considerable distance above the lamps on cross-arms and were carefully lined up. At night they cannot be seen at all, and in the daytime the appearance offers as little objection as is possible with overhead wires. The appearance of the graceful but strong steel poles carrying symmetrically strung lines is very favorable as compared to the former cumbersome and unsightly wooden poles bearing irregular festoons of wires.

THE LIGHTING FIXTURES.

The city was laid out in four separate circuits and the lamps so arranged in the business district that in case one circuit became disabled the street would not be in darkness, this being effected by using a separate circuit for the lamps on each side of the street: The brackets were made especially of 1½-inch wrought-iron pipe with a cast-iron scroll, attached to two pole bands, which were made hollow. The wires from the lamps leave the pipe brackets for the pole at a point opposite the lower pole band and thence are carried upward inside the pole into a cap, where they emerge from two outlets and are brought down outside to tap the proper service wires. Bringing the lamp leads through the upper pole band would have saved a little wire but would have weakened this band, which has to carry most of the weight of the lamp.

In developing the lamp fixture, the experts named above decided that, while a standard prismatic band refractor gave good distribution, it would be possible to

improve its appearance and reduce the glare when viewed from a point near the pole. This result was obtained by combining a frosted bowl with an eight-inch band refractor. A two-inch hole in the bottom of the bowl gives ventilation and permits dust and insects to fall out, while collection of dust on the inside is avoided by the smooth and steep interior surface. The smooth and steep exterior also prevents the collection of dust and rain-water and the alighting of birds upon the lamp. A standard series socket with film cut-out is used for the lamps, the greater number of which are 80 c.p. The lamps have an elongated latch and removable globe holder, and by means of a pole with a lamp remover at one end, the lamps can be changed easily and the glassware cleaned by an operator standing in the street.

A special casting also was designed with the object of giving a good balanced appearance in connection with the glassware and brackets used and a shape so that birds could not alight upon it, of providing a body large enough to accommodate a compensator for use with larger lamps, and of facilitating access to the lamp and globe for replacement and cleaning.

While the lamp fixture was designed especiall yfor South Norwalk, the equipment has now been standardized and can be purchased of the manufacturers. Since the glassware described above was designed, an improvement has been made which adds to the appearance of the globe both day and night and betters the distribution of the light. The inner prismatic band and the frosted bowl are now made in one piece, outside of which is a prismatic bowl which is continuous the full length of the glassware instead of stopping at the lower edge of the band.

Eighty c.p. lamps were found satisfactory for most of the fixtures, but in some cases 100 c.p. lamps were used to give additional light. The power required is about 120 watts per pole, and the poles average 100 feet apart. This makes only 240 watts in the residence section, where the lamps are staggered. The lamps are placed 15 feet above the road surface.

Mr. Winchester and the electrical commissioners of South Norwalk believe that by this system they obtain the best illumination possible with available design of fixtures at an initial and operating cost much less than is usual with ornamental systems. The system is ornamental by both day and night, the intensity of illumination is high enough for cities of average size and yet does not require the large amount of power needed for so-called "white way" lighting, and it is safe from the

DAYLIGHT VIEW OF SOUTH NORWALK STANDARDS AND LAMPS.

WEST AVENUE, SOUTH NORWALK, CONNECTICUT. 80 C. P. LAMPS IN NEW FIXTURES.
The halos do not exist in reality, but are an effect of the camera, as photographers will understand.

standpoint of both the passerby and the wire man. It is found that the operating maintenance cost of the double lamp unit of each standard is between $20 and $25 a year.

The engineering work of installing the system was done by the J. G. White Engineering Corporation. The lamp fixtures and apparatus were furnished by the General Electric Company and the special globes by the Holoplane Glass Company.

THE ARMY'S UTILIZATION OF CAMP WASTES*

New Form of Contract Secures Greater Economy in the Use of Food, More Material from Which Glycerine Can Be Derived, and Larger Revenue—Tabulated Data from the Various Camps.

By F. C. BAMMAN.

If, in endeavoring to compare the former contracts with those now in force, we assume that the true composition of the garbage produced at the various camps conforms to the ideal condition assumed in making up the contracts, the present value of the waste can be approximately compared with that previous to last July. Table No. 3 gives this comparison for each of the National Cantonments and it will be noted that in each instance the present value far exceeds that of the previous contracts; even the assumption that the present per capita wastage prevailed during the older contracts would not give values equal to those now being obtained.

Possibly the most surprising feature indicated by Table No. 3 is the wide range in the prices for each set of figures. This indicates a considerable field for improvement on the part of the army officials, it hardly seeming possible that local conditions can entirely account for the variances shown.

Tables No. 4 and No. 5 give in considerable detail the prices paid under existing contracts at the various camps. Some very interesting comparisons with Table No. 1 are possible.

Table No. 4 brings out an objection to the values shown in the preceding table. In every instance the contract price for "other garbage" is less than that for the separated materials. Thus, if any of the material which should be segregated finds its way into "other garbage" the value given in Table No. 3 immediately falls. It is accordingly important to the government that segregation as contemplated is actually carried out. The percentage figures of Table No. 2 show that a large amount of the higher grade material has been sold with the mixed garbage and that the values given in Table No. 3 are higher than those being received. Separation in the army is not yet perfect.

Actual returns show that for the six months ending January 1st the new contracts yielded over $500,000 more than would have been returned to the government had the 1918 contracts still been in force. This in spite of the fact that with the signing of the armistice the number of men in camp decreased rapidly and that May and June of last year found about 150,000 more men in camp than during any subsequent month.

It will be noted from Table No. 5 that not all of the present contracts are on a separation basis. The camps given in this table, however, are mostly so small that segregation would result in too small quantities to warrant handling. In the kitchens of these camps, however, segregation is practiced and reports are made on a separation basis.

The reason for particularly specifying the third object of the new contracts, making available to the government any glycerine-containing material, has already been mentioned. As a matter of fact, the necessity for this action did not arise and although the greater part of the segregated meats and fats were treated to recover glycerine, recovery in all but one instance was in private plants.

The original army plan regarding glycerine recovery proposed the establishment of 16 rendering plants. Of this number only one has thus far been built. The main difficulty lay in obtaining the necessary equipment and the time required, first, to build the proposed rendering plants, and, second, to secure the forces necessary to efficiently operate such plants. The reduction in amount of meats and fats actually segregated over that assumed when the contract was made up, a reduction of around 7 per cent, seemingly indicates the wisdom of permitting the segregated material to be handled in private plants.

The amount of pork and other valuable materials available through the utilization of army garbage cannot be definitely determined. Experiments have shown that an average daily ration of twenty pounds of camp garbage will produce a gain of one pound per day in the hog. The average wastage for 1918 can certainly be assumed as one pound per man per day. For the year, this assumption would give 18 pounds of pork as the production from the garbage of one man.

The daily average number of men in camp during

*Concluded from page 308.)

Table No. 3. Comparison of Returns, Contracts Expiring July, 1918, With Present Contracts.

Cantonment.	Approximate Contract Price Per Ton for Kitchen Waste. Previous to July, 1918.	Since July, 1918.	Remarks.
Devons; Ayer, Mass	$1.87	$15.07	First price includes receipts for manure
Upton; Yaphank, N. Y.	1.58	11.05	
Dix; Wrightstown, N. J.	1.65	11.98	
Meade; Admiral, Md.	1.64	12.04	
Lee; Petersburg, Va.	1.31	6.05	
Jackson; Columbia, S. C.	.99	8.97	
Gordon; Atlanta, Ga.	1.35	9.40	
Sherman; Chillicothe, Ohio.	1.84	9.86	
Taylor; Louisville, Ky.	2.96	10.76	First price includes receipts for manure
Custer; Battle Creek, Mich.	1.56	6.65	
Grant; Rockford, Ill.	1.65	10.15	
Dodge; Des Moines, Iowa.	1.64	7.41	
Funston; Ft. Riley, Kansas.	1.97	9.11	
Pike; Little Rock, Ark.	1.91	10.40	
Travis; San Antonio, Texas.	1.65	12.13	
Lewis; American Lake, Wash.	2.80	5.69	First price includes receipts for manure

NOTES: Figures for price prior to July, 1918, are based on the estimated camp strength and a per capita waste of two pounds per day.

Figures for price after July, 1918, are based on the estimated camp strength and the percentages of wastes given in the text. They represent the return with perfect separation; actual returns are somewhat lower.

Table No. 4. Contract Prices for Various Classes of Kitchen Wastes, U. S. Army, Effective July 1, 1918.

Camp or Station.	Contract Price per 100 Pounds — Bread. (a)	Meats & Fats. (b)	Bones. (c)	Other Garbage. (d)	Expiration of Contract.
Artillery Training Center, Fort Sill	$2.05	$4.02	$0.52	$0.08	June 30, 1919
Beauregard	.60	3.00	.50	.40	June 30, 1919
Cody	2.00	2.00	.50	.25	June 30, 1919
Colt (1)	.25	2.00	.50	....	June 30, 1919
Crane (1)	1.35	1.00	1.00	.18	Dec. 31, 1918
Custer	1.00	2.75	.60	.04	June 30, 1920
Devens	.20	8.00	1.00	.05	June 30, 1919
Dix	4.33	4.96	.95	.04¼	June 30, 1920
Dodge	1.00	3.00	.70	.05	June 30, 1919
Funston	1.50	2.50	.50	.18¾	June 30, 1919
Gordon	1.50	3.25	.90	.12	June 30, 1919
Grant	1.00	4.50	.80	.05	June 30, 1920
Greene (1)	.25	.20	.22	.10¼	June 30, 1919
Hancock	1.00	3.25	1.00	.12	June 30, 1919
Humphreys, A. A. (2)	....	....	....	.04 1/6	June 30, 1920
Jackson	1.50	3.25	.90	.10	June 30, 1919
Johnston	1.50	3.25	.90	.11	June 30, 1919
Lewis (2 contracts)	.50	.50	.60	.15	June 30, 1919
	.65	.65	.78	.30	June 30, 1919
Logan (2 contracts)	.40	.40	....	.30	June 30, 1919
	...	....	1.25	....	June 30, 1919
McClellan	.17½	.17½	.17½	.17½	June 30, 1920
Meade	4.33	5.01	.95	.05½	June 30, 1919
Merritt	....	4.00	.90	.05½	June 30, 1919
Newport News	3.00	2.00	.75	.02½	June 30, 1919
Pike	2.00	4.50	.75	.06	June 30, 1920
Sevier	.50	.50	.50	.20	June 30, 1919
Sherman	1.50	3.25	1.10	.13	June 30, 1919
Sheridan	1.00	4.50	1.50	.06	June 30, 1919
Taylor	1.75	3.50	1.05	.16	June 30, 1919
Travis	1.20	2.25	.75	.41	June 30, 1920
Upton	.25	4.00	.90	.05¼	June 30, 1920
Wheeler	1.00	4.50	1.50	.06	June 30, 1920
Fort Crook (1)	....	....	....	1.55	June 30, 1919
Fort McPherson (1)	.37½	.37½	.30	.37½	June 30, 1919
Ft. Ontario—General Hospital	....	1.00	1.00	....	June 30, 1919
Ft. Rosecrans (1) 2 contracts	1.00	2.50	....	....	June 30, 1919
	...	....	.65	.35	June 30, 1919
Fort Snelling (1)	....	....	....	.27½	June 30, 1919
Columbus Barracks (1)	...	1.10	....	.15	June 30, 1919
Vancouver Barracks (1)	.32	.32	.32	.32	June 30, 1919
Hazelhurst Field (1)	....	.08½	.15½	1.00	June 30, 1919
Del Rio Garrison (1)	....	....	....	.06	June 30, 1919
U. S. Gen. Hospital No. 1 (1)	....	....	1.50	.20	June 30, 1919
Presidio of San Francisco (1)	2.25	5.50	1.51	.41	June 30, 1919
U. S. General Hospital No. 2 (1)	....	8.00	1.00	....	June 30, 1919
Fremont (1) (4)	2.65	7.50	1.50	.41	June 30, 1919
Lee (3) (5)	3.00	3.00	.75	.02½	June 30, 1919
D. Q. M. El Paso (1)	.40	2.10	.50	.45	June 30, 1919
Jefferson Barracks (1) (6)	....	....	1.00	....	June 30, 1919
Fort Constitution (1)	....	....	1.00	6.00 (7)	
Jefferson Barracks (1)	.50	.50	....	.50	June 30, 1919
Fort Worden (1)	.50	.60	.50	.15	
Aer. Gen. Supply Depot (1) (8)	....	8.50	1.00	....	
Fort Benjamin Harrison (1)	10c. per man per month.	....	.25 (9)	....	
		....	2.00 (10)	....	
Raritan Arsenal (1)	¾c. per man per month.	7.00 (11)	....	....	
		4.00 (12)	....	....	

1. Contractor makes collection from messes.
2. Contract for sale of "a," "b," "c" not completed.
3. Contract may be terminated on 30 days' notice, when rendering plant is completed.
4. Cooked grease $11.25 per hundredweight; cooked meat, $3.50 per hundredweight.
5. Cooked grease, $5 per hundredweight; cooked meat $1 per hundredweight.
6. Cooked grease, $12.50 per hundredweight; cracklings, $4 per hundredweight.
7. Cooked grease.
8. Cooked grease, $15.50 per hundredweight.
9. Cooked bones.
10. Green bones.
11. Raw fat per hundredweight.
12. Cooked fat per hundredweight.

1918 was approximately 1,500,000. This figure at 18 pounds per man would give the pork as produced as 27,000,000 pounds for the year.

It is very doubtful if the actual production even reached half of this amount. The above estimate makes no allowance for pigs dying, uneaten garbage and numerous other factors, all tending to diminish the output. It is more than safe to assume, however, that 40 per cent efficiency was attained or that nearly 11,000,000 pounds of pork raised on camp garbage was sold during 1918. With the need of fats and pork products, this was in no sense a small contribution.

THE CONSERVATION AND RECLAMATION DIVISION

The work of the Conservation and Reclamation Division is far more extensive than its title would suggest. Possibly its full field can best be understood by quoting the regulation giving its purpose and function, and by outlining the personnel engaged in salvage work.

The regulation in question (Special Regulations No. 77) reads as follows:

The Salvage Division, in addition to the care and disposition of waste products of the army, is charged with the following:

a. The operation of shops for the repair of clothing,

hats, shoes, rubber boots, rubber coats, ponchos, tents, leggins, cots, stoves, field ranges, saddles, harness, animal-drawn vehicles and other equipment.

b. The operation of plants for laundering, dry cleaning or disinfection of hats, garments, shoes, and equipment pertaining to the army as needed for their salvage.

c. The procurement of repairs and renovation, either by contract or by installation, control, operation, and maintenance of the shops, plants, and facilities needed therefor, or by a combination of contract and operation thereof, as the interests of the service may require.

d. The salvage and development of agricultural, mineral, and forest land owned, purchased, or leased for the army, without interfering with authorized gardening and farming thereon.

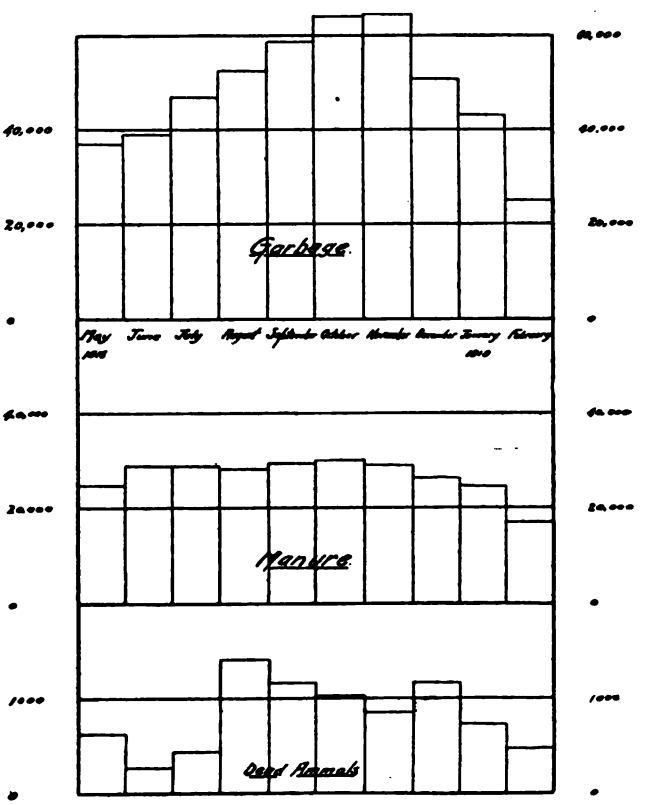
e. The organization, discipline, training, and command of special units, companies and battalions adapted to the efficient operation of each authorized activity mentioned above; to train men in salvage work for service in the United States and overseas; to furnish vocational training to enlisted men in the army; and the hiring of necessary labor when military organizations are not available or are not sufficient.

f. The care and responsibility for all articles turned in for salvage and the disposition thereof.

g. The preventing of all necessary waste resulting from the preparation, handling, and consumption of food, co-operating for this purpose with schools for cooks and bakers; to segregate from the garbage and other waste matter fats and other elements that have a commercial value, and collect, assort, classify, and dispose of waste material in a manner advantageous to the government.

h. The encouragement and promotion among all, by systematic propaganda and salvage; and to impress upon every individual in the army the advantage and necessity of whole-hearted co-operation in the movement to save by intelligent salvage. Everyone in the military service will render all possible assistance in this matter, as it is not intended that the salvage officer will assume the entire responsibility for salvage work.

i. The salvage officer, in conjunction with the constructing quartermaster, will recommend sites for the necessary new buildings for the salvage service at camps, cantonments, posts, etc., subject to the approval of the commanding officer. The sites recommended should permit the proper grouping of the salvage plants in so far as conditions, space, and topography will permit. Warehouses should have proper railway facilities.



REVENUE FROM CAMP WASTES.

SALVAGE ORGANIZATION.

The salvage company authorized for a camp strength of 27,000 or more men is made up as follows:

Section.	Commissioned.	Enlisted.
Headquarters, Administration Section	3	43
Laundry	1	302
Waste Material and Transportation	1	82
Repair Shops	2	..
a. Clothing repairs	..	52
b. Shoe and Harness Repairs	..	47
c. Dry Cleaning and Hat Repairs	..	28
d. Canvas and Hardware Repairs	..	19
Animal-drawn Vehicle Repair	..	15

Table No. 5. Prices Paid for Camp Wastes at Various Camps and Posts.

Contracts Effective July 1, 1918, and now in Force.

Camp or Station.	Price.
Douglas, Ariz.*	$2.10 per kitchen per month
Stephen D. Little*	30.00 per kitchen per month
Marfa*	1.25 per kitchen per month
Stanley*	6.00 per kitchen per month
Barron Field*	12.00 per squadron mess
	6.00 per hospital
	12.50 per officers
Brooks Field*	8.00 per kitchen per month
Call Field*	7.50 per kitchen per month
Carlstrom Field*	5.10 per kitchen per month
Dorr Field	4.00 per kitchen per month
Kelly Field*	6.00 per kitchen per month
Love Field*	17.50 per kitchen per month
Fort Crockett*	25.25 per kitchen per month
Fort Clark*	3.00 per kitchen per month
Fort Huachua*	6.01 per kitchen per month
Fort McIntosh	5.00 per kitchen per month
Fort Sam Houston*	10.10 per mess & $31.00 per officers kitchen
Watertown Arsenal*	2.00 per kitchen per month
Camp Forrest, Chickamauga Park, Ga.†	1 cent per man per station per month
Camp Forrest (war prison barracks)†	50.00 per station per month
Camp Forrest (general hospital No. 14)†	35.00 per station per month
Camp Forrest (sanitary trains of G. annex)	25.00 per station per month
Camp Forrest (hospital group of G. annex)†	25.00 per station per month
Furlong†	25.00 per station per month
Scurry*	51.00 per station per month
Shelby*	100. per station per month
Yuma†	15.00 per station per month
Fort Keogh	90.00 per station per month
Fort Brady*	15.00 per station per month
Fort McDowell*	75.00 per station per month
Fort McArthur*	3.00 per station per month
Fort Riley*	30.00 per station per month
Fort Miley	16.00 per station per month
Fort Winfield Scott*	100. per station per month
Fort L. H. Roots	15.00 per station per month
Fort H. G. Wright*	30.00 per station per month
Fort Sheridan	40.00 per station per month
Port of Embarkation, Hoboken *	60.00 per station per month
March Field*	30.00 per station per month
Park Field*	45.00 per station per month
Wilbur Wright Field*	60.00 per station per month
General Hospital No. 15*	10.00 per station per month
Army & Navy Hospital*	15.00 per station per month
Fort Omaha*	1,500 per station per annum
Fort Slocum*	100. per station per annum
	Grease $8.50 per hundredweight,
	Bones $1.50 per hundredweight
Fort Totten*	200. per station per annum
Letterman General Hospital*	1,000 per station per annum
Holabird§	1.00 per ton
Langley Field* (2 contracts)	1.00 per day
Fort Des Moines*	75 cents per day
Alcatraz*	25 cents per barrel

*Contractor makes collection from messes.
†Contract may be terminated on 10 days' notice pending complete organization of camp; new bids to be requested when camp is organized.
§Cooked fats per hundredweight.

Table No. 5-A—Contract Prices for Kitchen Waste in Various Camps.

Effective July 1, 1918.
Contractor makes collection from mess.

Camp or Station	Price per man per month	Expiration of Contract
Bowie	$7.60 per 150 men per month	June 30, 1919
Dick	.07 per man per month	" " "
Kearny	.01 per man per month	" " "
McArthur	7.75 per 150 men per month	" " "
John Wise	.04½ per man per month	Jan. 1, 1919
Carruthers Field	.08 per man per month	June, 30, 1919
Ellington Field	75.00 per 1,000 men per month	" " "
Mather Field	.06 per man per month	" " "
Rockwell Field	.05 per man per month	" " "
Taliaferro Field	15.00 per 100 men per month	" " "
Fort Moultrie	85.00 up to strength of 1,600	" " "
Fort Stevens	5.05 per 100 men per month	" " "
Fort Thomas	76.00 up to strength of 3,000; $11.00 additional 1,000 men	" " "
Rock Island Arsenal	.02 per man per month	" " "
Madison Barracks	.30 up to 1,500; $1.00 for each other 100 men	" " "
Aviation Mechanics' Training School	.06 per man per month	" " "
Presidio of Monterey	.04½ per man per month	" " "
Eagle Pass, Tex	.01½ per man per month	" " "

Table No. 6—Summary of Sales, Camp Wastes; May, 1918, to March, 1919.

Month 1918	Dead Animals	Manure	Paper, Metal, etc. Actual Sales	Paper, Metal, etc. Reissued	Garbage
May	629.05	24,274.05			37,115.88
June	292.55	28,777.28			39,262.88
July	434.50	28,804.99			47,563.12
August	1,417.28	28,133.64			52,408.29
September	1,178.45	29,642,42			58,911.33
October	1,032.63	29,950.83	324,041.45	300,000.00	64,118.43
November	875.70	29,191.40	222,476.74	219.939.92	64.433.46
December	1,183.75	26,452.68	309,964.40	82,629.83	51,019.21
January	736.18	24,541.51	392,203.67	81,937.48	43,600.52
February	483.74	17,527.77	486,749.10	126,283.62	25,065.47

NOTES: The column headed "Reissued" gives the estimated value of materials turned in for salvage but found suitable for use in some branch of the army.
The amounts given under "Garbage" for May and June are payments under the old contract. These payments, while listed in the last column, really represent the amount paid for some of the other camp wastes as well.
The blank spaces of the table for the months following June do not indicate that no sales of the material were made, but rather that the record is not available.
The drop in sales during late months is due to demobilization.

The enlisted personnel of this company consists of men disqualified for any reason for service over seas, except in the case of skilled artisans not obtainable from this source. In the smaller camps, various sections of the salvage company are scaled down to meet the particular requirements at that camp.

The system of reports employed in correlating the data from the various camps, etc., is most interesting and shows that careful regard of detail so necessary when administrative policies are to be based on such reports and data.

In sending in the individual reports, each camp salvage officer notes any reasons for changes from previous reports and such local data as available for consideration when the summary sheets are studied for camp comparisons. It is this system of checks that is responsible for the big reduction in per capita waste and more recently for the checking in the increased waste following the signing of the armistice.

The kindness of Capt. E. M. Mayer, Jr., in charge of the Garbage & Fertilizer Section, in making the records of that section available to the writer, has revealed the painstaking and detailed study which has been given to at least that part of the work of the Reclamation Division, both in headquarters and in the field. The value of the work is unquestionable and the decision to continue the work when the army returns to a peace basis is easily understandable.

The army's experience with the utilization of camp wastes is one that many municipalities can study with much interest and profit. While the details of the army methods may hardly be practicable with the conditions usually found in civil life, the fundamental facts that utilization need not be injurious to health, that it need not cause nuisance, that it is less expensive of operation than other methods. that it is of economical importance to the community and to the nation; these facts hold for civilian "camps" as well as those of the army.

THE LIGHTING PLANT OF ST. CHARLES.

St. Charles, Ill., operates a municipal electric light plant which it believes is a financial as well as a physical success. The city has a population of 5,500 and its government comprises a mayor and six aldermen. The streets are lighted with four hundred type C, 100 c. p., mazda nitrogen lamps. In the main street and adjacent streets are seventy-two 3-light ornamental poles and eighteen 5-light piles. In the three parks of the city are thirty single-light ornamental poles and about fifty small lights. These are in addition to the four hundred street lamps.

The city charges 12 cents net per k. w. h. for electricity, to which price it was raised from 10 cents on June 1st of last year, to which lower price it will again be reduced in all probability, if coal prices should show a substantial reduction. The receipts of the plant have increased from $16,891 in 1914 to $24,405 in 1918. The amount paid out for wages, supplies, extensions and repairs in 1914 was $16,823, while the total for all operation expenses, etc., in 1918 was $20,768. This shows an operating profit of $78 in 1914 and $3,637 in 1918, the profit having been greater each year than the year previous.

This profit makes no allowance for interest or depreciation, but more than $20,000 has been spent out of the income for extensions during the five years, and it is considered that this would be ample to cover these overhead charges. In addition, no credit is given for the street lighting or the lighting of the city hall, fire house, parks, etc., and it is estimated that this has a value of over $26,000 per year. Combining this free lighting and the extensions, we have more than $30,000 a year to cover interest and depreciation, which would seem to be ample.

PRICES OF PAVING AND PAVING MATERIALS

Some Figures Comparing Conditions During the Past Six Years in Fifteen Cities of the Middle Atlantic States and Some Others, and Forecasts for 1919.

In our issue of February 22d we published a number of reports from different sections of the country, giving the prospects of road work and the prices of paving and materials. Among these was one for the middle Atlantic States, prepared by W. A. Howell, engineer of the Bureau of Streets of Newark, N. J. Owing to an attack of "flu," Mr. Howell was unable to tabulate for publication the large amount of data he had collected. These have now been tabulated and are given herewith.

Mr. Howell wishes to acknowledge the courtesies received from the following officials who aided him in preparing his report for the February 22d issue:

Charles A. Rudolph, street and sewer commissioner, Wilmington, Del. Charles M. Upham, state highway engineer, Delaware.

New York; Richmond borough, John E. Bowe, acting com'r of Pub. Works; Queens, J. J. Blake, eng'r of highways; Bronx, S. C. Thompson, eng'r of highways. Albany, Frank R. Lanagan, city eng'r. Yonkers, Lawrence Griffith, city eng. Niagara Falls, W. B. Bennett, city eng. Olean, E. E. Allen, city eng. Schnectady, Lewis B. Sebring, city eng. Binghamton, W. Earl Weller, city eng. Troy, A. E. Roche, city eng. Syracuse, Henry C. Allen, city eng. Utica, Joseph Kemper, city eng. Poughkeepsie, E. W. Sylvester, sup't.

Philadelphia, C. F. Paff, Jr., ass't ch'f eng. Bureau of

COMPARATIVE PAVING—1913 TO 1919.

City.	Year.	Paving done—amount and material; sq. yds. or miles.	COST OF LABOR AND MATERIALS. Labor, per day.	Stone, per cu. yd.	Sand, per cu. yd.	Cement, per bbl.	COST OF PAVING.
Bayonne, N. J.	1916	104,003 asph.; 4,390 granite	$2.00	$1.80	$1.25	$1.85	
	1917	60,683 asph.; 19,324 granite	3.25	1.90	1.25	2.25	
	1918	32,303 asph.	4.50	3.05	2.30	3.25	
	1919	60,000 asph.; 8,500 granite	4.50	3.65	3.00	3.85	
East Orange, N. J.	1914	Bitulithic, 10,423; plain telford macadam, 5,713	1.75	1.40	1.60	1.90	
	1915	Plain telford macadam, 5,658	1.75	1.35	1.75	2.05	
	1916	Asph. block, 16,401; plain telford macadam, 5,600	2.50	1.35	1.80	2.20	
	1917	Wood block, 13,950; asph. block, 6,126.	3.25	2.00	1.80	2.55	
	1918	None	3.75	2.35	2.50	3.40	
Chicago, Ill.	1917	166.56 miles total					
	1918	Brick, 10.23; asphalt, 41.53; wood block, 1.01; granite 0.71; asphalt macadam, 8.86					About 20% to 30% more than 1917.
	1919	No program, probably 50% to 100% more than 1918.					About 30% to 40% more than 1917.
Kansas City, Mo.	1917	31.6 total					
	1918	Brick, 1.1; asphalt, 2.13; macadam, 0.6					About 20% to 25% more than 1917.
	1919	About 500,000 sq. yds. total					About 30% more than 1918.
St. Joseph, Mo.	1917	6.8 total					
	1918	Asphalt, 0.14; macadam, 0.16					
	1919	Much more than 1918					About 100% more than 1917.
Sedalia, Mo.	1917	12,716 total					
	1918	Brick, 1,754; concrete, 500					
	1919	10 times as much as in 1918					About 30% more than 1918.
New York City: Manhattan	1913	Asphalt, 315,095; asph. block, 6,760; wood block, 121,401; granite, 237,005					Asphalt, $2.89; asph. block, $2.73; wood block, $3.61; granite, $4.29.
	1914	Asphalt, 177,002; asph. block, 3,072; wood block, 56,369; granite, 117,782					Asphalt, $2.11; asph. block, $2.25; wood block, $3.19; granite, $3.90
	1915	Asphalt, 132,347; asph. block, 915; wood block, 6,025; granite, 65,832					Asphalt, $1.68; asph. block, $2.47; wood block, $3.12; granite, $3.74
	1916	Asphalt, 328,171; wood block, 18,176; granite, 86,778					Asphalt, $2.16; wood block, $3.98; granite, $4.41
	1917	Asphalt, 278,191; wood block, 19,705; granite, 137,233; bit. concrete, 6,717					Asphalt, $2.87; wood block, $4.41; granite, $5.37; bit. concrete, $2.75; concrete for foundation, $6.88
	1918	Asphalt, 156,467; wood block, 6,801; granite, 138,349					Asphalt, $4.04; granite, $7.21; concrete for foundation, $9.13
	1919	Total, 2,500,000 sq. yds.					
Brooklyn	1917	Asphalt, 494,128; bit. concrete, 51,265; asph. block, 2,308; granite, 104,827					Asphalt, $2.35; granite, $4.19. Refined asphalt, $21.70 per ton ($13.45 in 1915); Portland cement, $2.22 ($1.41 in 1915); broken stone, $1.90; sand, $1.08
	1918	Asphalt, 94,650; bit. concrete, 36,124; asph. block, 11,804; granite, 8,777; wood blk., 4,218					Asphalt, $2.34; asph. block, $2.42; granite, $4.21; refined asphalt, $36.00; Portland cement, $2.22; broken stone, $2.48; sand, $1.38
Richmond	1913	Bit. concrete, 95,771; bit. macadam, 5,954; napped granite, 18,478; relaid granite, 3,377; wood block, 69,133; brick, 8,504.					Bit. concrete, $1.00; bit. macadam, $1.42; napped granite, $1.16; relaid granite, $0.68; wood block, 3", $1.95, 4", $2.34; brick, $1.73
	1914	Bit. concrete, 63,055; bit. macadam, 8,723; granite, 17,441; napped granite, 12,919; wood block, 27,180; brick, 8,908.					Bit. concrete, $0.83; bit. macadam, $0.84; granite, $2.64; napped granite, $1.10; 3" wood block, $1.895; brick, $1.58
	1915	Bit. concrete, 2,475; bit. macadam, 5,619; granite, 5,916; brick, 1,213					Bit. concrete, $0.85; bit. macadam, $1.12; granite, $2.48; brick, $1.73
	1916	Asphalt block, 3,844; bit. concrete, 13,893; bit. macadam, 14,315; granite, 10,130; napped granite, 1,986; relaid granite, 3,241; brick, 4,678					Asphalt block, $1.47; bit. concrete, $1.24; bit. macadam, $0.84; granite, $3.80; napped granite, $1.10; relaid granite, $1.24; brick, $2.03
	1917	Bit. concrete, 110,514; bit. macadam, 7,078; granite, 6,305; brick, 8,897					Bit. concrete, $1.56; bit. macadam, $1.48; granite, $4.38; brick, $2.43
	1918	Bit. concrete, 25,703; bit. macadam, 1,926; granite, 2,681; brick, 1,117					Bit. concrete, $2.55; bit. macadam, $2.00; granite, $5.33; brick, $3.00
Queens	1913	Asph. concrete, 204,504; asphalt, 45,639; asph. block, 103,006; wood block, 65,830; improved granite, 56,973; granite, 364					(Costs do not include base.) Asph. concrete, $1.10; asphalt, $1.28; asph. block, $1.82; wood block, $2.62; improved granite, $3.08; granite, $1.30 (relaid).
	1914	Asph. concrete, 55,885; asphalt, 61,556; asphalt block, 8,922; improved granite, 43,091; granite, 32,346					Asph. concrete, $0.85; asphalt, $1.80; asph. block, $1.72; improved granite, $2.80; granite, $1.72

COMPARATIVE PAVING—1913 TO 1919 (Continued).

City.	Year.	Paving done—amount and material; sq. yds. or miles.	COST OF PAVING.
	1915	Asph. concrete, 2,595; asphalt, 25,104; asph. block, 14,129; imp. granite, 24,618	Asph. concrete, $0.74; asphalt, $0.78; asph. block, $1.56; imp. granite, $2.79
	1916	Asph. concrete, 32,964; asphalt, 50,357; wood block, 1,136; imp. granite, 23,898	Asph. concrete, $0.72; asphalt, $1.09; wood block, $2.58; imp. granite, $3.00
	1917	Asph. concrete, 17,735; asphalt, 80,961; asph. block, 17,616; wood block, 4,862; imp. granite, 32,650; granite, 2,500; bit. macadam, 11,164	Asph. concrete, $0.82; asphalt, $1.31; asph. block, $1.81; wood block, $2.25; imp. granite, $3.22; granite, $3.37; bit. macadam, $1.23
	1918	Asph. concrete, 43,502; asphalt, 30,285; asph. block, 17,857; wood block, 1,928; imp. granite, 15,124; bit. macadam, 4,900	Asph. concrete, $1.38; asphalt, $2.24; asph. block, $2.36; wood block, $3.50; imp. granite, $4.05; bit. macadam, $1.51
Montclair, N. J.	1913	Dolarway, 1,023; Topeka, 4,526; wood block, 3,533	Dolarway, $1.30; Topeka, $1.63; wood block, $2.97
	1914	Asph. telford macadam, 5,899; plain macadam, 1,729; resurfacing, 147,350	Asph. macadam, $0.98; plain macadam, $0.93
	1915	Asph. macadam, 13,773; resurfacing, 624,000	Asph. macadam, $1.36
	1916	Warrenite, 11,590; concrete, 3,950; asph. macadam, 7,496; Topeka, 32,614; resurfacing, about 25,000	Warrenite, $2.17; concrete, $1.52; asph. macadam, $1.26; Topeka, $1.80
	1917	Asph. macadam, 1,480; resurfacing, 160,200	Asph. macadam, $1.49
	1918	Brick, 1,558; Warrenite, 69,922; Resurfacing, 177,180	.....
	1919	Total, 102,500; resurfacing, 160,000	.....
Elizabeth, N. J.	1913	Total 4.43	Total cost, $261,000
	1914	" 2.37	" " 118,000
	1915	" 3.32	" " 139,266
	1916	" 3.61	" " 187,699
	1917	" 2.01	" " 141,108
	1918	" 1.53	" " 120,746
	1919	.....	" " 620,000
Jersey City, N. J.	1914	Granite, 26,194; brick, 6,329; asphalt, 3,251; wood block, 5,622	Granite, $3.16; brick, $2.16; asphalt, $2.19; wood block, $2.87
	1915	Brick, 19,027; asphalt, 2,974; wood block, 7,270; granite, 15,006; asph. block, 2,616; bit. concrete, 58,549; granite repaving, 3,327	Brick, $2.11; asphalt, $1.97; wood block, $2.65; granite, $3.28; asph. block, $1.97; bit. concrete, $0.95; granite repaving, $1.43
	1916	Asphalt, 2,323; brick, 7,620; granite, 23,730; wood block, 2,730; asph. block, 1,242; bit. concrete, 56,986	Asphalt, $1.89; brick, $1.97; granite, $1.51; wood block, $3.00; asph. block, $2.28; bit. concrete, $0.90
	1917	Wood block, 1,742; asph. block, 4,347; bit. concrete, 568	Wood block, $2.76; asph. block, $2.35; bit. concrete, $1.79
	1918	Asphalt on old stone, 34,800; asphalt on old base, 11,750; bit. concrete, 7,492; granite, 4,238; wood block, 335; bit. concrete on old macadam, 34,000	Asphalt, $2.06 on old stone, $1.97 on old base; bit. concrete, $1.88; granite, $3.84; wood block, $2.58; bit. concrete on old macadam, $1.10
	1919	Let in 1918: asphalt on old stone, 22,500; asphalt on old concrete, 10,310; asphalt, 19,725; bit. concrete, 5,588; bit. concrete on old macadam, 27,000. Not yet let: granite, 86,055; asphalt, 40,840; wood block, 8,800	Asphalt on old stone, $1.80; asphalt on old concrete, $1.47; asphalt, $2.45; bit. concrete, $2.32; bit. concrete on old macadam, $1.10
Passaic, N. J.	1913	Topeka, 4,000; asphalt, 10,510; bitulithic, 16,411; bit. macadam, 27,100	Topeka, $1.69; asphalt, $1.87; bitulithic, $2.19; bit. macadam, $0.90
	1914	Asphalt, 31,420; bitulithic, 5,949; granite, 543; bit. macadam, 32,300	Asphalt, $1.81; bitulithic, $2.19; granite, $3.50; bit. macadam, $0.90
	1915	Asphalt, 27,570; bit. macadam, 32,673	Asphalt, $1.95; bit. macadam, $0.80
	1916	Asphalt, 11,970; bit. macadam, 15,496	Asphalt, $1.69; bit. macadam, $0.85
	1917	Asphalt, 15,080; bit. macadam, 8,140; granite, 96	Asphalt, $2.26; bit. macadam, $1.48; granite, $4.00
	1918	Asphalt, 4,724; granite, 4,457	Asphalt, $3.25; granite, $3.50
Newark, N. J.	1914	Bitulithic, 7.09; granite, 3.47; reclipped granite, 1.83; brick, brick, 1.68; asphalt, 0.63; asph. block, 0.59; wood block, 1.86	Bitulithic, $2.25; granite, $3.18; reclipped granite, $2.29; brick, $2.20; asphalt, $2.04; asph. block, $2.53; wood block, $3.34
	1915	Asphalt, 0.20; asph. block, 0.90; bitulithic, 2.40; brick, 0.13; granite, 1.22; napped granite, 0.24; wood block, 0.91	Asphalt, $1.59; asph. block, $2.83; bitulithic, $2.26; brick, $1.58; granite, $3.05; napped granite, $2.72; wood block, $2.77
	1916	Asphalt, 3.04; asph. block, 0.76; bitulithic, 0.45; granite, 1.10; telford, 0.44; wood block, 0.83	Asphalt, $1.71; bitulithic, $2.20; granite, $3.12; telford, $1.07; wood block, $2.66
	1917	Asphalt, 1.87; asphalt on old base, 0.84; asphalt block, 1.56; bitulithic, 3.06; brick, 0.12; granite, 1.09; napped granite, 0.31; wood block, 1.03; wood block on old base, 0.87	Asphalt, $2.37; asphalt on old base, $1.70; asph. block, $2.38; bitulithic, $2.52; brick, $2.78; granite, $3.45; wood block, $3.44; wood block on old base, $2.54
	1918	Asphalt, 0.97; asphalt on old base, 1.37; asph. block, 0.19; bitulithic, 0.80; brick, 0.07; granite, 0.52; napped granite, 1.15; wood block, 0.34; wood block on old base, 0.04; telford, 0.18; warrenite, 1.34	Asphalt, $2.85; asphalt on old base, $2.28; asph. block, $2.45; bitulithic, $2.91; brick, $3.14; granite, $3.95; napped granite, $2.21; wood block, $4.43; wood block on old base, $4.50; telford, $1.90; warrenite, $2.98
Yonkers, N. Y.	1913	Asphalt, 2,214; asph. block, 15,494; Hassam, 76,032; bit. macadam, 8,138	Asphalt, $2.38; asph. block, $2.65; bit. macadam, $2.46
	1914	Granite, 4,284; asphalt, 47,707; asph. block, 6,158; bit. macadam, 19,013	Granite, $2.62; asphalt, $2.53; asph. block, $2.50; bit. macadam, $1.88
	1915	Granite, 759; asph. block, 35,995; bit. macadam, 5,664	Granite, $3.00; asph. block, $2.45; bit. macadam, $2.50
	1916	Granite, 6,005; asphalt, 18,327; bit. macadam, 41,176	Granite, $3.70; asphalt, $2.49; bit. macadam, $1.82
	1918	Granite, 33,535; bit. macadam, 24,382	Granite, $4.50; bit. macadam, $2.65

Highways. Reading, E. B. Ulrich, city eng. York, C. F. Wallow, city eng. Wilkes-Barre, B. K. Finch, city eng. Norristown, S. Cameron Corson, city eng.

New Jersey state highway eng., W. G. Thompson. Elizabeth, Thos. E. Collins, city eng. Plainfield, Andrew J. Gavett, supt. pub. works. Atlantic City, J. W. Hackney, city eng. Montclair, W. F. Bates, city eng. Passaic, Colin R. Wise, city eng. Bloomfield, Ernest Baechlin, town eng. Trenton, Abraham Swan Jr., eng. of streets. West Orange, Chas A. Winston, town eng. East Orange, W. D. Willigerod, city eng. Orange, W. Crane, city eng. Jersey City, Chas. E. Van Keuren, ch'f eng.

Prices Paid for Materials.

City. Year.	Labor.	Broken stone.	Gravel.	Sand.	Cement.
New York:					
Queens:					
1913	....	$2.65	....	$1.12	....
1914	....	2.39	$2.07	1.03	....
1915	....	1.79	1.47	.94	....
1916	....	2.19	1.71	.91	....
1917	....	2.29	1.44	1.15	....
1918	....	2.79	2.47	1.42	....
Bronx:					
1913	$2.50	1.96	....	1.29	....
1914	2.50	1.95	1.95	1.10	....
1915	2.50	1.285	1.87	1.10	....
1916	2.50	1.59	1.37	.89	$1.68
1917	2.50	1.88	2.90	1.03	2.28
1918	3.00	2.43	2.75	1.75	2.34
1919	3.25	2.62	....	....	3.50
Syracuse, N. Y.:					
1913	1.50	1.70y	....	1.00y	1.35
1914	1.50	1.70y	....	1.00y	1.35
1915	1.50	1.70y	....	1.00y	1.18
1916	1.60	1.70y	....	1.00y	1.50
1917	2.00	2.00y	....	1.25y	1.79
1918	3.20	2.25y	....	1.75y	2.25
Binghamton, N. Y.:					
1916	2.00-2.40	....	1.50y	1.75y	1.60
1917	2.64-3.00	....	1.50y	1.75y	2.00
1918	3.20-4.00	....	1.75y	2.00y	3.25
Niagara Falls, N. Y.:					
1913	1.60	.66t	1.75y	0.83t	1.50
1914	1.60	.66t	1.75y	.83t	1.75
1915	2.00	1.07t	1.75y	.92t	1.75
1916	2.40	1.12t	1.75y	.95t	1.80
1917	2.80	1.12t	1.75y	.95t	2.00
1918	4.00	1.55t	2.25y	1.16t	3.25
Utica, N. Y.:					
1913	.20	....	....	.62t	....
1914	.20	....	....	.62t	....
1915	.20	....	....	....	1.39
1916	.22	1.29t	....	.62-.79t	1.82
1918	.40	2.00t	....	1.05t	3.52
Jersey City, N. J.:					
1913	....	1.35y	....	.80y	1.75
1914	....	1.35y	....	.75y	1.75
1915	....	1.35y	....	.75y	1.60
1916	....	1.35y	....	.80y	1.66
1917	....	1.75y	....	1.00y	1.77
1918	....	3.00y	....	2.00y	2.60
1919	....	3.00y	....	2.00y	4.00
Newark, N. J.:					
1913	....	1.85y	....	1.25y	1.85
1914	....	1.85y	....	1.25y	1.70
1915	....	1.85y	....	1.25y	1.65
1916	....	1.85y	....	1.15y	2.05
1917	....	1.85y	....	1.25y	2.60
1918	....	2.85y	....	2.15y	3.35
Reading, Pa.:					
1913	....	1.10t	....	....	....
1914	....	1.30t	....	....	....
1915	....	1.07t	....	1.05t	....
1916	....	1.26t	....	....	1.80
1917	....	1.53t	....	1.44t	2.50
1918	....	1.83t	....	2.25t	3.10
Houston, Tex.:					
1917	22½-25	....	1.50y	1.00y	....
1918	35-40	....	....	1.25y	....
1919	37½-40	....	1.50y	1.25y	....
Ft. Worth, Tex.:					
1917	25	2.50y	1.50y	1.50y	....
1918	30	3.00y	1.90y	2.00y	....
1919	35-37½	2.50-3.00	2.00y	2.25y	....
Ardmore, Okla.:					
1918	....	2.50y	2.00y	2.00y	....
1919	....	2.80y	2.40y	2.40y	....

Note: y—per cubic yard; t—per ton.

The chief engineer of the department of public service of Columbus, O., Henry Maetzel, a few weeks ago made a study of the matter of prices in that city from the year 1910 to date, in order to show the trend; these covering the features of grading, straight curb, circle curb, brick pavement and asphalt pavement. In the matter of grading, the average contract price per cubic yard (measured in place and including disposal of the material) increased more or less uniformly from 44 cents in 1910 to 80 cents in 1917, increasing to $1.03 in 1918, and falling to 83 cents in the single bid so far received in 1919. The maximum bid in 1919 was $1.25 and the minimum bid was 70 cents.

For straight curb of Berea sandstone, 5 by 18 inches, set on six inches of gravel and backed with six inches of gravel, the average price increased uniformly from 46 cents per lineal foot in 1910 to 53 cents in 1916, was 64 cents in 1917, 80 cents in 1918 and 75.6 cents in 1919; the maximum in 1919 being 88 cents and the minimum 70 cents. For circular curb, similar in other respects to the straight curb, the average price increased uniformly from 88.5 cents in 1910 to $1.42 in 1916; was $1.20 in 1917, $1.60 in 1918, and fell to $1.375 in 1919, the maximum being $1.50 and the minimum $1.25.

For brick pavement, including six-inch concrete base and one-inch sand cushion, the average price increased from $1.586 in 1910 to $1.91 in 1914, fell to $1.65 in 1915, was $1.848 in 1916, $2.274 in 1917, $3.51 in 1918, and $3.425 in 1919, the maximum bid this year being $3.43 and the minimum $3.42.

For asphalt pavement, comprising a one-inch binder course and a two-inch surface course laid on six-inch base, the average price increased gradually from $1.77 in 1910 to $1.942 in 1915, rising to $2.078 in 1916, $2.28 in 1917, and to $3.612 in 1919. (No asphalt pavement was laid in 1918.) The maximum bid in 1919 was $3.69 and the minimum was $3.54.

The minimum prices were, as might be expected, more irregular in their variations than were the averages, but those for grading and curbing followed very nearly parallel to the average in each case. In the case of brick pavement, the minimum paralleled the average except in 1913 and 1917, when individual low bidders offered prices 30 cents below the average in the former year and 80 cents below in the latter. In the case of asphalt pavement, the minimum ran about eight to fifteen cents below the average except in 1915, when one low bidder was 24 cents below the average.

KEEPING TRUCK COSTS.

Most large users of trucks, both municipal and private, endeavor to keep a record from which can be calculated the cost of operation and by which can be compared the efficiency of the drivers as well as of the various makes of trucks. The methods of keeping itemized costs vary more or less, and the results obtained by them consequently vary, so that comparisons between different cities or companies is not as instructive as it should be. Moreover, some of the systems are undoubtedly more accurate or informative than others. In an investigation of this matter, considerable variations were found to exist between the records of companies where supposedly accurate truck costs are being kept, such variations amounting to 65 per cent in the depreciation or sinking fund records, 21 per cent in handling maintenance charges, and 13 per cent in keeping tire costs.

Appreciating the value of a standardized cost system that could be applied to all makes of trucks, both electric and gasoline, in every kind of business, truck owners and manufacturers got together and, after fifteen months' study of dozens of previous cost systems, perfected what they have called the "national standard truck cost system"; and it is reported that already the costs of over 18,000 trucks are being kept by this system. This system has been drawn up and printed in a folder, each containing forms sufficient for one truck for one year. These folders can be obtained at 25 cents each (which is the bare cost) by applying to Harold P. Gould, chairman, Truck Owners' Conference, 327 South LaSalle St., Chicago.

NEWS OF THE SOCIETIES

May 6-8.—NATIONAL FIRE PROTECTION ASSOCIATION. Annual convention, Ottawa, Can. Secretary, Franklin H. Wentworth, 87 Milk St., Boston, Mass.

May 13-14.—AMERICAN ASSOCIATION OF ENGINEERS. Annual meeting, Chicago, Ill. Secretary, C. E. Drayer, 29 South LaSalle St., Chicago, Ill.

May 14-15.—LEAGUE OF TEXAS MUNICIPALITIES. Seventh annual convention, Sweetwater, Tex. Secretary-treasurer, Frank M. Stewart, University of Texas, Austin, Tex.

May 19-24.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Atlantic City, N. J. Secretary, T. C. Martin, 29 W. 39th St., New York.

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

June 17-20.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, St. Paul-Minneapolis. Secretary, Charles W. Hunt, 33 W. 39th St., New York, N. Y.

June 23-26. — SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, Coates House, Kansas City, Mo. Secretary, E. L. Fulkerson, 617 Washington St., Waco, Tex.

June 24-27. — AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University.

June 24-27.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

Conference on National Department of Public Works.

A conference of engineering and architectural organizations was held in the assembly hall of the Western Society of Engineers at Chicago, April 23-25, in response to a call issued by the Engineering Council, New York, through the National Service Committee of the Council, M. O. Leighton, Secretary, 502 McLachlen Bldg., Washing, D. C. The engineering and architectural organizations that responded to the call were 76 in number, with a membership of over 98,000 persons, and were represented by 70 delegates. In addition the Council was represented by 7 members and the National Service Committee by two.

Although all sections of the country responded to the call by sending delegates from organizations interested in every phase of engineering and architectural activity, there was a decided unanimity of purpose and ideas and the lively and extended debates developed no factional differences. This can be accounted for by the sincere desire of all the delegates to lend every possible aid to the purpose of the conference—that of establishing a National Department of Public Works. Another striking feature of the conference. Even if the object of the conference be not realized, the friendly and respectful intercourse between the two professions there established will well repay the expenditures of effort that were made in carrying out the conference program.

The conference was organized by the selection of M. O. Leighton as chairman and E. S. Nethercut as secretary. Seven sessions of the conference were held and a complimentary banquet was given by the General Committee of Technical Societies of Chicago to the delegates. An extended discussion of principles and scope of a National Department of Public Works resulted in the adoption of an expression favoring the establishment of such a governmental department. The various phases of this discussion touched many phases of engineering development and government administration. The result in form of resolution follows:

"This conference of delegates from engineering and related organizations respectfully recommend to the public and to the Congress, that legislation be enacted covering the following principles:

(1) That the services and bureaus of the National Government having to do chiefly with matters of engineering and architecture, be grouped in one department to be known as the Department of Public Works.

(2) That the Department of Public Works comprise those works which are built and operated for the use of the Public.

(3) That the Department of Public Works be made available when desirable for the performance of special engineering and architectural work for the use of other Government bureaus.

(4) That there be a systematic classification and organization of engineers, architects and other employes whose status shall be such that they may be recruited and maintained on merit."

Under leadership of the Committee on Government Engineering Activities, there was an extended discussion in which the limits of the proposed department were considered. As the Department of the Interior employs at this time more engineers than any other department in the world, it was decided that the department was the one most adaptable to being transformed into a Department of Public Works. To this Department it is proposed to transfer the various Bureaus now operating in other Departments

(*Continued on page 330*)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Weatherford, Tex., is having plans prepared by the consulting engineers, H. E. Elrod Co., for PAVING IMPROVEMENTS, to cost about $180,000.

Corning, Ia., is having plans prepared by the consulting engineers, Archer & Stevens, for the construction of a SEWAGE DISPOSAL PLANT and 25,000 feet of sanitary sewers.

Sharon Springs, Kans., is to make WATERWORKS and ELECTRIC LIGHT PLANT IMPROVEMENTS, for which preliminary plans have been prepared by the consulting engineering firm of Black & Veatch.

HIGHWAY WORK, involving the construction of about fifty-five miles from Little Rock to Hot Springs, Ark., is to be begun soon. Plans were prepared by the consulting engineers, Lund & Hill.

WATERWORKS IMPROVEMENTS to cost $1,000,000 are to be made by Elyria, O., including entire new plant, filter house, etc., plans for which have been prepared by the consulting engineer, W. G. Clark.

Floyd County, Rome, Ga., is to build a concrete HIGHWAY from Rome to Lindale, three and a half miles in length, for which $110,000 is available. Plans are being prepared by the consulting engineers, the J. B. McCrary Co.

Fairmont, W. Va., is to build an addition to FILTRATION PLANT, the estimated cost being $110,000. The consulting engineer is George W. Fuller.

WATERWORKS IMPROVEMENTS are to be made by the city of Henrietta, Okla., to cost $350,000, plans having been prepared by the consulting engineers, Burns & McDonnell.

Lorain, O., is having plans prepared by the Filter Manufacturing Co., consulting engineers, for WATERWORKS IMPROVEMENTS to cost $100,000, including filter house, two settling basins, etc.

Bryan, O., is to make WATERWORKS IMPROVEMENTS, including storage reservoir of 1,000,000 gallon capacity, two deep wells, etc., to cost $100,000. The consulting engineer is A. H. Smith.

Newark, N. Y., has voted $280,000 bonds to build a gravity WATER SUPPLY SYSTEM, including 1,000,000-gallon rapid sand filtration plant, earth dam and dike, etc. The consulting engineer is J. P. Wells.

PAVING IMPROVEMENTS, involving the construction of approximately fifteen miles of combined curb and gutter, will be made by the city of Washburn, Wis., according to plans prepared by the consulting engineer, W. F. Reichardt.

INDUSTRIAL NEWS

The Iron and Steel Situation.

There seems to be little hope of breaking the deadlock over the price stabilization plans of the administration, although, following a cable from President Wilson, the Industrial Board held further conferences with representatives of the Railroad Administration. The latest development is the handing in of resignations of all the members of the Industrial Board to Secretary Redfield—but these have not been accepted so far.

Meanwhile buyers of steel seem to be marking time. A real open market is expected, but there is no telling when it will come. There is an open market at present theoretically, but there is no tendency to extensive or spectacular price cutting.

The larger steel companies seem to be planning to continue business on the basis of the prices agreed upon between the Industrial Board and the manufacturers some time ago, no matter what may be the outcome of the controversy in Washington.

An official of one of the large steel companies has predicted that there would be no price cutting campaign unless it was undertaken by some of the smaller producers, in which case it would not be important, and insisted that the price of steel would not be lower during the remainder of the year. On the other hand he was inclined to the belief that it might be considerably higher before fall.

In the cast iron pipe market, activity in the south is noted, many cities which have not bought for four years now being forced to purchase. In the cast, however, there is little municipal buying because of prices. Quotations: Chicago—4-inch, $59.80; 6-inch and larger, $56.80. New York—4-inch, $60.70; 6-inch and larger, $57.70; class A, $1 extra.

Nicholas S. Hill, Inc., and S. F. Ferguson, consulting engineers, announce the removal of their engineering offices and laboratory from 100 William st., to 112 East 19th st., New York City, on May 1.

Colombian Market for Road-Building Material.

According to trade commissioner P. L. Bell, the Department of Bolivar, Colombia, has authorized the construction of new roads and extensive repairs and surfacing of old roads along the western coast, a total distance of 450 kilometers (280 miles). For this the following road-building equipment will be needed: Auto trucks (automatic dumping type), scrapers (wheel type and ordinary), large road rollers (steam type), grading machines, ditching machines (gas engine drive), miscellaneous tools, and culvert material. At present there is an annual contribution of $150,000 for new roads and the Department is negotiating a new loan of $2,000,000 with which to actively push this work. (The name of the official to whom inquiries should be addressed may be obtained from the Bureau of Foreign and Domestic Commerce at Washington or its district and cooperative offices by reference to file No. 40197.)

Water of Big Pool Ozonized.

A large, modern and well-equipped swimming pool is to be opened this year to the public at New Krug park, Omaha, Neb. The contract for purifying the water has been awarded, after competition, to the **Ozone Company of America,** Milwaukee, Wis.

SWIMMING POOL PURIFIED BY OZONIZATION, OMAHA, NEB.

The pool itself will extend over more than an acre and the beach, which entirely surrounds the pool, will cover a similar area. Bath house facilities are provided for accommodating 4,000 persons at one time, or up to 15,000 to 20,000 during the day and evening. To fill the pool, more than 1,000,000 gallons of water will be needed, which will be taken from the regular city supply, and, after treatment, will be kept in constant circulation through the pool, a complete change of water being made every 12 hours.

All of the water, before it enters the pool, will be screened, coagulated, filtered and finally completely purified by ozonization to destroy all bacteria, the Ozone Company installing the necessary equipment. In addition, the water will be aerated by constant circulation over large cascades.

The accompanying illustration shows a view of the pool.

NEWS OF THE SOCIETIES

(*Continued from page* 329)

and to detach many of the Bureaus now included in the Department of the Interior.

The inability of securing an additional Department and cabinet member was well understood and the proposed plan follows the line of least resistance. A vote was taken on the various factors entering into the proposed scheme for the guidance of the Committee which at a subsequent session presented the following report, which was adopted:

Your Committee charged with a consideration of the question which Government activities should be coordinated in a National Department of Public Works, recommends:

1. That the establishment of a National Department of Public Works should be accomplished by grouping those Government bureaus, services, commissions and other activities whose functions are predominately of an engineering or architectural character, in which is now the Department of the Interior and thereafter designating that Department "The Department of Public Works."

2. That the transfer of any bureau, service or commission from any other Department to a Department of Public Works should be accomplished without change in personnel, compensation and general plan of organization, leaving the coordination of the several activities; the simplification of organization and the establishment of additional bureaus such for example, as a Bureau of Chemical Engineering, to be effected as the need for the same may from time to time become apparent.

3. That in transferring river and harbor work and other non-military in character, but now in charge of the Engineer Corps of the United States Army, to a department of Public Works, the relation of the Army engineers to such work be not changed that there should be no relinquishment of non-military duty by the Army engineers now on such duty until the transfer of these Engineers to Military Duty can be made without detriment to the Public Interests.

Your Committee finds that among the bureaus, services and activities which logically belong in a Department of Public Works are the following:

A Bureau of Public Roads.
The United States Reclamation Service.
The Alaskan Engineering Commission.
The Construction Division of the U. S. Army.
A Bureau of River, Harbor and Canal work including such functions as are now exercised by the Mississippi River Commission, and the California Debris Commission.
A Bureau of Architecture.
A Bureau of Surveys, including the Coast and Geodetic Survey.
A Bureau of Mines.
The Geological Survey.
The Forest Service—at least until the same is divorced from the supervision of water powers and road building.
The Bureau of Standards.

Your Committee believes that it would be unwise to determine at this time to what extent the proposed Department of Public Works should control the engineering activities of the General Land Office; of the National Park Service; of the Bureau of Lighthouses; of the Bureau of Indian Affairs, and of the Public Health Service and of various commissions, such as Commissions on buildings and grounds, and therefore suggest that such matters may well be deferred for consideration to a later date, preferably until the Department has been organized.

(Signed) C. E. Grunsky, J. Parke Channing, James H. Herron, Irving K. Pond, Baxter L. Brown, P. Junkersfeld, Frederick K. Copeland, W. O. Hotchkiss.

It was decided that this conference should not attempt to draft a bill, for presentation to the Congress, establishing a Department of Public Works. The care and labor involved in such an undertaking was fully appreciated and the efforts of the conference were restricted to indicating the plan and scope of such a Department.

The following resolution was adopted: "That this conference be known

as Engineers, Architects and Conference on National Department of Public Works, that it continue in existence until dissolved by its own action and that its officers and committees be empowered to further the development of a National Board of Public Works."

As indicated in the resolution, the organization of the conference was made permanent and its termination provided for. This enabled the conference to appoint an Executive Committee, Committee on Text of Bill and a Campaign Committee. The Executive Committee has power to create a Finance Committee and add to the members. The Campaign Committee consists of:

M. O. Leighton, chairman, Washington, D. C.; Francis Blossom, New York; Frederick K. Copeland, Chicago; Daniel A. Garber, New York; Cass Gilbert, New York, C. E. Grunsky, San Francisco; P. Jnkersfeld, Boston; C. F. Loweth, Chicago; Phillip N. Moore, St. Louis; F. H. Newell, Urbana, Ill.; M. C. Tuttle, Boston; W. O. Winston, Minneapolis; C. B. Burdick, Chicago; W. H. Nichols, New York.

The Committee on Text of Bill consists of:

M. O. Leighton, chairman ex-officio; John W. Alvord, Chicago; A. S. Baldwin, Chicago; Lincoln Bush, New York; W. K. Hatt, La Fayette, Ind.; E. H. Lee, Chicago; Irving K. Pond, Chicago; Isham Randolph, Chicago; Gardner S. Williams, Detroit; Horace S. Winchell, Minneapolis; Charles T. Main, Boston.

Among the delegates present were the following:

W. L. Abbott, American Society of Mechanical Engineers; A. J. Baldwin, American Society of Civil Engineers; W. H. Finley, American Association of Engineers; Samuel A. Greeley, American Public Health Association; C. E. Grunsky, Pacific Association of Consulting Engineers; Edward Haupt, Association of General Contractors of America; W. O. Hotchkiss, American Association of State Highway Commissioners; E. J. Mehren, American Road Builders' Association; Leonard Metcalf, American Water Works Association; E. C. Millard, American Civic Association; Isham Randolph, Western Society of Engineers; B. C. Shankland, American Institute of Consulting Engineers; John B. Taylor, American Institute of Electrical Engineers; F. A. Vaughn, Illuminating Engineering Society.

National Fire Protection Association.

The twenty-third annual meeting of the National Fire Protection Association will be held at Ottawa, Canada, May 6, 7 and 8, in the ballroom of the Chateau Laurier. On Tuesday morning following addresses of welcome by the Duke of Devonshire, Governor General of Canada, and Mayor Harold Fisher of Ottawa, and reports of officers of the association, a number of important committees will present their reports. These will include the committees on Public Information (Franklin H. Wentworth, Boston, chairman); State Fire Prevention Associations (Thomas R. Weddell, Chicago, chairman), twelve states being represented; Canadian Committee (John B. Laidlaw, Toronto, chairman); Fire and Accident Prevention Day (H. P. Weaver, Philadelphia, chairman), and Manufacturing Risks and Special Hazards (Benjamin Richards, Chicago, chairman). There will be presented five-minute reports from local chapters and organization members on work in fire prevention.

The afternoon session will be devoted to reports by the committees on the following subjects: Automatic Sprinklers (C. L. Scofield, Montreal, chairman); Field Practice (C. H. Patton, Cleveland, chairman); Nomenclature (Mason R. Strong, New York, chairman), and Fire-Resistive Construction (Ira H. Woolson, New York, chairman). These reports will be followed by a paper on "Certificates of Occupancy," by Rudolph P. Miller, New York, and discussion.

On Wednesday morning the three committees on the following subjects will report: Electrical Committee (Dana Pierce, New York, chairman); Signaling Systems (Ralph Sweetland, Boston, chairman), and Safety to Life (H. W. Forster, Philadelphia, chairman).

This session will be followed by a luncheon arranged by the Canadian Committee. W. H. Shapley, chairof the Dominion Fire Prevention Committee, will preside and Sir Thomas White, K. C. M. B., Acting Prime Minister of Canada, will speak. In the afternoon, the new Parliament Building which is being erected on the site of the one burned in 1915, will be inspected. There will follow a display of the Ottawa fire department in front of the building, under Chief J. W. Graham. The delegates will then enjoy a drive, tea being served at the Experimental Farm.

In the evening there will be a public fire prevention meeting in Collegiate Institute, at which Edward P. Heaton, Fire Marshal of Ontario, will preside. A motion picture, "An Unbeliever Convinced," will be shown by courtesy of the Underwriters' Laboratories. A. R. Small will deliver an address on "Underwriters' Laboratories, An Internation Public Service," illustrated by motion pictures of laboratory tests. Franklin H. Wentworth will speak on "The National Fire Prevention Association: International."

On Thursday morning committees on the following subjects, under the chairmen named, will report: Marine Fire Hazards (Samuel D. McComb, New York); Fire Pumps (H. O. Lacount, Boston); Gases (J. I. Banash, New York); Inflammable Liquids (Edward A. Barrier, Boston); Hazardous Chemicals and Explosives (George W. Booth, New York); Standardization of Pipe and Pipe Fittings (Walter Teague, New York). Motion pictures of Tests of Automatic Sprinklers in Film Storage Vaults will be shown by J. F. Ancona, by courtesy of the Eastman Kodak Co.

A business session and election of officers will follow. These names have been submitted by the nominating committee: For president, Mr. F. J. T. Stewart (New York); for 1st vice-president, Mr. H. O. Lacount (Boston, Mass.); for 2nd vice-president, Mr. W. E. Mallalieu (New York); for secretary-treasurer, Mr. Franklin H. Wentworth (Boston, Mass.); for chairman of executive committee, Mr. Rudolph P. Miller (New York); for executive committee (for three years), Mr. D. Knickerbacker Boyd (Philadelphia); Mr. J. H. Brumbaugh (Chicago); Mr. John H. Kenney (Baltimore); Mr. John B. Laidlaw (Toronto); Mr. Willis O. Robb (New York); (for two years), Mr. Edmund L. Sanders (Worcester); for nominating committee (1920), three members, Mr. F. E. Cabot (Boston), chairman; Mr. W. H. Merrill (Chicago); Mr. T. B. Sellers (Columbus).

New York State Conference of Mayors and Other City Officials.

The New York State Conference of Mayors and Other City Officials will be held this year at Schenectady, on June 10 to 13.

PERSONALS

Blair, A. C., Lyons, Kan., has been appointed to the Kansas state highway commission, succeeding E. R. Moses, resigned

McLean, Capt. John A., has been appointed city engineer of Crookston, Minn., succeeding A. Hunt, who resigned on account of ill health.

Governor Kilby, of Alabama, has appointed F. J. Cramton, of Montgomery, John Craft, of Mobile, and S. R. Batson, of Birmingham, as the appointive members of the state highway commission. Senator John Craft is a member of the present commission and is one of the original good roads advocates in this state having devoted much of his time and attention to highway improvements for more than thirty years. F. J. Cramton is president of the Alabama Highway Improvement association and a successful business man. S. R. Batson is county road engineer of Jefferson county and is recognized as an expert.

Governor Goodrich of Indiana has appointed John Oliphant of Vincennes, Earl Crawford of Connersville, David C. Jenkins of Kokomo and Archibald Campbell of Kendellville as members of the new state highway commission.

Governor Bickett of North Carolina has appointed the following to the new state highway commission: Lieut. Frank Page, of Aberdeen, chairman, term of six years; John E. Cameron, of Kinston, four years, James K. Norfleet, of Winston-Salem, two years, and James G. Strikeleather, of Asheville, two years.

Buck, Ross J., contracting engineer, has been appointed assistant engineer for the Board of Sanitary Commissioners, Indianapolis Sanitary District.

Troskel, F. A., is now appointed city engineer of Marquette, Mich.

Judson, Hale D., following his resignation from the position of city engineer of St. Joseph, Mo., is now connected with the state highway engineering department.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

City Must Protect Highways.—Liability for Injury.

(N.Y.Sup.) It is duty of municipal corporation to erect railings or barriers along highway at points where necessary to make it safe and convenient for travelers in use of ordinary care, and it is liable for injuries resulting from breach of such duty.—Johnson v. State, 173 N. Y. S. 701.

Defective Condition of Street.—Liability of City.

(Okl.) A city need not have actual notice of condition of its streets with respect to liability for a resulting injury, and it is sufficient that defective condition had existed for such time that city in the exercise of ordinary care could have discovered it.—City of Cushing v. Bowdlear, 177 P. 561.

The defense of contributory negligence, in an action against a city for personal injury from alleged unsafe condition of street or sidewalk, is an affirmative defense which must be pleaded and proved.—Id.

Power to Levy License Taxes on Utilities Corporations.

(Va.) As Const. 1902, § 177, and Tax Bill 1916, §§ 28, 36½, forbid cities from levying any license taxes on railway companies, and from levying license taxes in excess of one-half of 1 per cent. upon corporations furnishing water, heat, light, or power, held, though a previous franchise ordinance, accepted by the predecessor of a company engaged in transporting passengers and furnishing light reserved the power to tax the property of the company and to levy a license tax, the city, in view of Code, § 558, could not levy a license tax on the company's street railway business, or license tax upon its business of furnishing light, etc., in excess of the amount allowed by statute, on the ground the license charges were compensation for use of the streets.—City of Lynchburg v. Lynchburg Traction & Light Co., 97 S. E. 780.

Destruction of Property by Police in Abatement of Nuisance.

(Wash.) In action to recover for property destroyed by police officers, held, that complaint could not be taken to allege that any court of defendant city had determined that plainiff's place of business was a nuisance, in view of Rem. Code 1915, § 287, as to manner of pleading determination of court or officer of special jurisdiction.—Hotel Cecil Co. v. City of Seattle, 177 P. 347.

In an action to recover for property destroyed by police officers, complaint held not to warrant inference that it had been determined, on account of any ordinance that plaintiff's place of business was a nuisance, in view of Rem. Code 1915, § 291, as to manner of pleading ordinance.—Id.

If police officers, who wrongfully destroyed property in plaintiff's place of business in summary abatement of nuisance, acted as agents of defendant city with respect to corporate duties and functions of city, as contradistinguished from those relating to the general public, the city would be liable.—Id.

If council of city of Seattle had not, by ordinance pursuant of Rem. Code 1915, § 7507, and charter, framed and adopted pursuant to section 7494, defined nuisances, or determined that plaintiff's place of business or property constituted a nuisance, the city would not be liable for property wrongfully destroyed by police officers in summary abatement of nuisance, regardless of whether the action was for negligence or trespass.—Id.

Ice on Sidewalk—Liability of City.

(Minn.) In an action for injury by falling over snow on a sidewalk, evidence as to the number of miles of sidewalk in city was admissible as bearing on its negligence in respect to time within which it should remove the snow.—Olson v. City of St. Paul, 170 N. W. 586.

In an action against a city for personal injury from defect in a street, evidence that the city made repairs after the injury was incompetent to establish plaintiff's negligence.—Id.

The duty of a city to keep its sidewalks in a safe condition for travel is not limited to structural defects, but extends to dangerous accumulations of ice and snow.—Id.

City's duty to keep its sidewalks in a safe condition for travel in respect to ice and snow requires reasonable care, in view of climatic and other conditions, and that after a sudden snowstorm they must be put into safe condition within a reasonable time.—Id.

Death from Police Automobile—Liability of City.

(Iowa) In an action against a city for wrongful death of plaintiff's intestate, resulting from the automobile which intestate was driving being struck by the city's police automobile, the burden of proof was upon the city to establish its affirmative defense that its driver was engaged in a governmental act.—Jones v. Sioux City, 170 N. W. 445.

In an action for death of plaintiff's intestate, caused by automobile which intestate was driving being struck by a city automobile running 45 miles an hour, evidence that the city's driver under his employment drove such automobile in performance of ministerial or corporate duties, at other times not too remote, was erroneously excluded, where the city sought the inference that such automobile was used exclusively for police purposes, from the word "police" appearing thereon.—Id.

A city is liable for the negligent acts of its servants when acting in a ministerial or corporate capacity.—Id.

The use of a city automobile to haul policemen to their beats in outlying districts is ministerial and corporate, and not governmental, as relating to enforcement of law, particularly where the city's driver was not a policeman.

Police officers, in the performance of their duty in making arrests and the like, are engaged in duties of a public nature, and the city is not liable for their negligence in performing such acts, if they bear some just and true relationship to the enforcement of law.—Id.

Sidewalks on Steep Grade—Liability of City.

(N.Y.Sup.) Whether sidewalks shall be constructed on grade to conform with grade of street, or with abrupt grades, as by inserting steps, ordinarily is matter of judgment for municipal authorities, for error with respect to which city is not answerable, until it is shown walk is dangerous, and it has actual or constructive notice in time to remedy condition.—Hesse v. City of New York, 173 N. Y. S. 827.

Where slope of sidewalk, on which plaintiff was injured by slipping while descending grade when walk was dry, was no greater than may be seen at different points on sidewalks of all municipalities, city was not liable for injury.—Id.

Ministerial Functions of Municipal Officers—Legitimate Acts—Condemnation Arbitration.

(Tenn.) A purely ministerial function of a municipal officer is one as to which nothing is left to discretion, while legislative acts involve the exercise of discretion and judgment.—Lotspeich v. Mayor and Aldermen of Town of Morristown, 207 S. W. 719.

The powers possessed by municipal officers must be viewed as public trusts, and legislative powers of the board of mayor and aldermen cannot be delegated to the mayor, although mere ministerial powers may be so delegated.—Id.

Where Acts 1903, c. 103, under which a city was incorporated, vested in the board of mayor and aldermen all power to contract, an arbitration agreement made by the mayor with one whose property the city desired to condemn for a new city hall building was void, for, though the board of mayor and aldermen by resolution directed the mayor to enter into a written agreement of arbitration, and select arbitrators, held, that such acts involved discretion, and the power to perform the same could not be delegated.—Id.

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI NEW YORK, MAY 10, 1919 No. 19

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*
CHARLES CARROLL BROWN, *Western Editorial Representative*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issu.

Editorial Notes 333
Educating the Tax Payers—Municipal Bonds—Aid the "Own-Your-Own-Home" Campaign.

Report on Detroit Waterworks (Illustrated)..... 334
An experimental filtration was operated for twelve months and demonstrated the possibility of filtering Detroit's water at an unusually high rate. Other results of the operation of this plant and the design of the permanent plant by R. Winthrop Pratt, the consulting engineer, are described.

Sewage Disposal at Columbus..... 337
The report for 1918 shows that treatment is insufficient during warm weather. Foaming of Imhoff tanks and filter flies are discussed and some cost figures given.

Okmulgee's Water Supply and Sewerage..... 338
Reconstruction of the systems, including pumping and purification of the water and treatment of the sewage.

Brick Pavements 340
Engineers of the Bureau of Public Roads report on pavements in the middle western states, and their conclusions as to importance of subgrade, base, lugs, joint fillers, etc.

Miami Flood Control Works..... 341

The Municipal Index..... 342

News of the Societies..... 347

Industrial News 348

Contract News 17

EDUCATING THE TAXPAYERS.

Detroit's officials believed that the city's water should be filtered and told the citizens so. But they did a great deal more—they actually filtered some of the water in a demonstration plant, showed the people how it was done and asked them to drink the water. Most of the citizens did not know much about hydrate of alumina, but they did know good water when they saw and tasted it, and the effort to explain the process, if it did not greatly enlighten them, at least gave them confidence in the intentions of the officials.

Experiences have demonstrated that tax payers generally will not accept without question dogmatic statements of officials or experts as to the needs of their public works and utilities. They are by nature suspicious and want to be shown. But an earnest and intelligent effort by officials to educate them on the subject will, in the great majority of cases, inspire confidence in the intentions of such officials and incline the voters to accept their judgment or make a wise decision in the matter when it is submitted to them.

MUNICIPAL BONDS.

April of 1918 set a record for recent years in the matter of small total of municipal bonds sold. April of 1919, while not breaking any records as to quantity of sales, has been surpassed by only three Aprils on record, the total sales being more than five times as great as in 1918. In commenting on these figures, "The Bond Buyer" says: "It is also of interest in this connection that authorizations of new bond issues are unusually heavy, which means that emissions of state and city bonds will continue on a large scale for some time to come."

AID THE "OWN-YOUR-OWN HOME" CAMPAIGN.

In its "Own-Your-Own-Home" campaign, which the U. S. Department of Labor is promoting throughout the country, it makes an appeal to the various municipalities for aid of a kind which can be rendered only by official action.

"Repeatedly it has been represented to the Department of Labor that municipal officials, in holding back extensions of water and gas mains, are vitiating much of the effort put forth by local committees in the interest of home owning and building." The department realizes that there is a limit to the extent to which a municipality should go in spending money to aid real estate development; but it believes that cities should

at this time extend these utiliies to the limit of their ability in so far as they will aid the "own your home" movement. This furnishes an additional argument why cities should go ahead promptly with extensions and improvements that have been delayed during the war or that will aid in bringing back normal business and labor conditions.

The department makes another suggestion also, which is that cities insure the permanency of value of the new homes and of the conditions surrounding them by adopting and enforcing restrictions for such areas which will prevent their being invaded by buildings or industries of a kind which experience has shown have almost invariably depreciated the value of residential property.

REPORT ON DETROIT WATERWORKS

Filter Plant Operated for Twelve Months—Demonstrates Possibility of Filtering Detroit's Water at Very High Rate—As Demonstration Plant It Educates the Public—Plans for Permanent Plant.

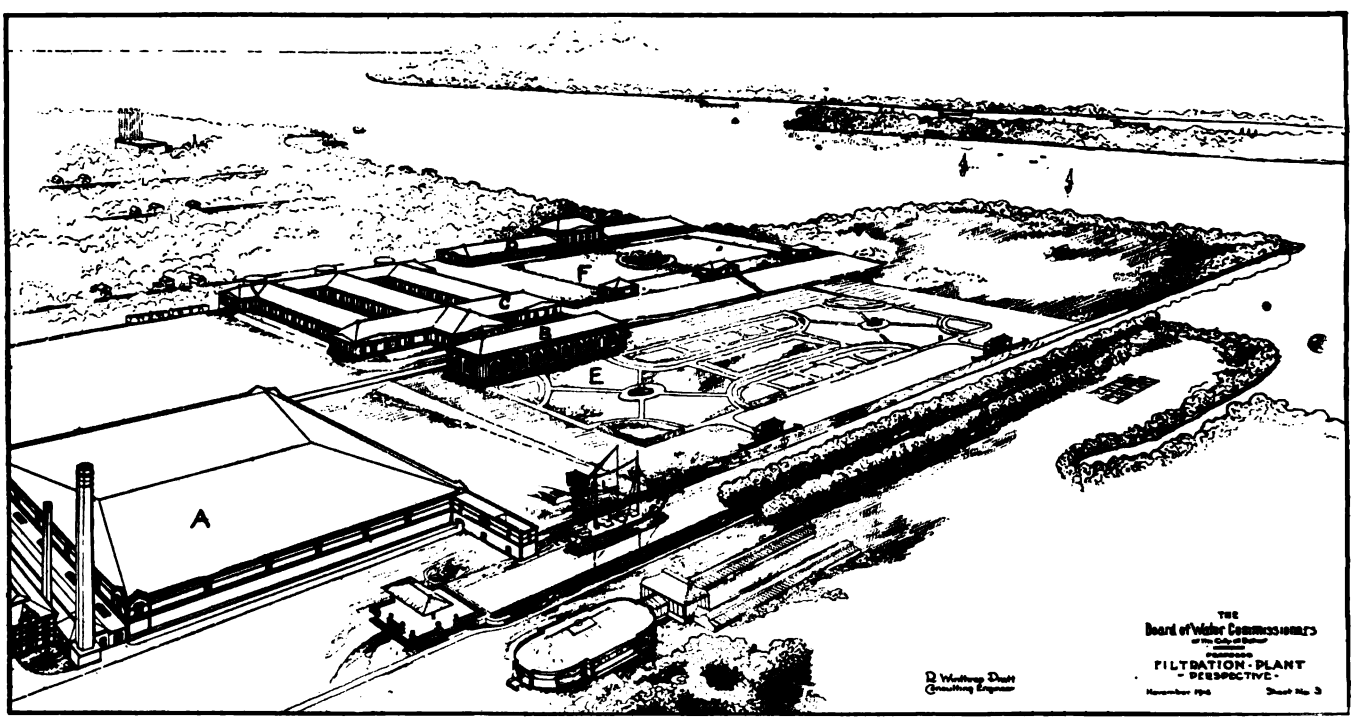
In the fall of 1917, the Board of Water Commissioners, of Detroit, Mich., engaged R. Winthrop Pratt to investigate and report upon the improvements desirable in certain features of the water supply of that city. Mr. Pratt's report was made in March of this year, the interval of a year and a half having been devoted largely to the construction and operation of an experimental filtration plant, which it was thought desirable to run for a continuous period of twelve months.

Perhaps the feature of this report most interesting to other cities and waterworks officials is the demonstration of the value of a special investigation by means of an experimental plant in determining the possibilities of filtering the particular water in question. According to Mr. Pratt's conclusions from the operation of this experimental plant, it has demonstrated that the rate of filtration of Detroit's water can be made considerably higher than ordinary standard practice, which means that a considerable sum can be saved in the construction of the plant. As is stated in the report: "It is interesting to note that all the largest cities now having filtration plants, before adopting any plan, made careful tests on the respective local waters in order to be sure that the plan adopted would meet all requirements. Among such cities are the following: Philadelphia, St. Louis, Cleveland, Pittsburgh, Cincinnati, Washington, Louisville, Providence, Columbus, New Orleans and Harrisburg. Milwaukee is now conducting experiments.

"In other words, none of the large cities mentioned has simply copied the design of a plant which has been successful in some other place, but each has worked out the best design, or at least has tested out local waters by means of experimental studies and the operation of small temporary plants."

Another interesting feature of this investigation was the recognition of the importance of favorably influencing public opinion with respect to filtration. "The educational value of an experimental filter plant is a very important one. The majority of citizens, although desiring to have clear water, have had little or no opportunity for investigating or understanding the methods by which such water may be secured. The plant, therefore, was designed so that the process by which the water was treated could be easily understood by all visitors."

"It was originally intended that the experimental filter should be open to the public in order that the citizens might see the process and become informed as to the possibilities of filtration. The closing of the park on



GENERAL PERSPECTIVE OF PROPOSED FILTRATION PLANT IN WATER WORKS PARK.
A—Existing old pumping station. B—Low-lift pumping station. C—Filter building. D—Mixing chambers. E—Filtered water reservoir. F—Coagulation basin.

account of the war, however, prevented the carrying out of this idea." As a practicable but less satisfactory substitute, the water was piped to a booth erected at the entrance to the waterworks park, where it was discharged into a plate-glass tank, where its transparency could be observed, and also was given to such citizens as might desire it, being removed by them in bottles or other hand-carried containers. This booth was described in Municipal Journal for July 13, 1918.

PROBLEMS INVESTIGATED.

The city's supply is drawn from the Detroit river through an intake ten feet in diameter, which terminates in an intake crib 3160 feet from the shore shaft of the intake tunnel. The river is of course more or less polluted, but the typhoid rate has not been high considering this fact. Disinfection of the entire supply began early in 1913, bleaching powder having been used at first, later replaced with liquid chlorine. Perhaps the weightiest argument with the public in favor of filtration was the turbidity of the water at certain times, although waterworks experts and physicians realized the greater importance of eliminating danger of water-borne diseases. It was thought possible that both of these ends might be obtained by taking the water from Lake St.

INTERIOR OF EXPERIMENTAL FILTRATION PLANT.
Coagulation basin in foreground, mixing chambers in left background, filters in right background.

Clair or Lake Huron, but Mr. Pratt shows that the cost of extending the intake to either of these lakes would be considerably greater than that of filtration, while the result would be a water much less desirable from either bacteriological or turbidity standpoint. There was of course no question but that the water could be filtered satisfactorily, and it was therefore decided that filtration was to be preferred to drawing the supply from either of these lakes.

Mr. Pratt also reports that he sees no reason for thinking it desirable to change the location of the present intake. There was, however, another difficulty in this connection, which was included in his investigation and report, this being the fact that the older of the pumps now in use were set at such an elevation that at low water the suction required is so great that they are not able to draw full capacity through the intake tunnel. Two methods were suggested for meeting this difficulty, one being to lower the pumps, the other to raise the water by auxiliary low-lift pumps which would operate during low water and pump into the suction well of the high-lift pumps in question. This was a matter which called for immediate attention, and was, perhaps, the first to

EXPERIMENTAL FILTRATION PLANT BUILDING.

be definitely decided upon. In view of the probability that a filtration plant would be installed near the pumping station within a few years, and that low-lift pumps would be required for raising the water to the elevation of such plant, it was decided to install these pumps under a design which would permit their being used temporarily for feeding the suction well as just described, and later be adopted for permanent use in connection with the filtration plant. Bids for this pumping equipment were received in November, 1918, and the contract for them was awarded this spring.

The desirability of softening the water was considered. The hardness of the Detroit water is about 85 parts per million, and was rarely complained of by native residents, being much less than that of other cities in the middle west, Toledo's water, for instance, having a hardness of 200 parts per million and that of Dayton 350 parts. It was calculated that the theoretical financial gain due to saving in soap would be no greater than the cost of softening the water, and therefore it was decided to at least postpone the construction of a plant for softening the water until more important improvements had been put into service.

CONCLUSIONS FROM FILTRATION EXPERIMENTS.

As a result of the twelve months' operation of the experimental filtration plant, the following conclusions were drawn:

1. The river water drawn through the present intake can be easily and satisfactorily purified by the process of rapid sand filtration. Its quality is well within the most severe standards fixed by sanitary authorities for a filterable water.

2. It is feasible to use higher rates of filtration than has been the practice generally in the middle west heretofore. This results in a decrease in the required area of filters and hence in a saving in the expense of constructing a filtration plant.

3. That instead of three or four hours sedimentation period, as has been the more general practice, less than a two hours' period will be ample, thereby making another large saving in construction cost.

4. That the use of a filter sand having an effective size of approximately 0.50 m.m. gives just as good results as the use of a finer sand and results in a large saving of wash water.

5. That while sulphate of iron as a coagulant used in connection with lime gave good results, the use of this material with the local water required more careful supervision. The handling of two kinds of material instead of one makes for additional labor charges and increased construction costs.

6. That a filtration plant of sufficient capacity to filter all the water that can be drawn through the present intake can be constructed on the present water works property.

The plant for supplying the city would have a capacity of about 300,000,000 gallons a day and would be larger than any single plant of the rapid sand type that has yet been built. Because of the comparatively low turbidity of the water, it seemed probable that it could be filtered at a higher rate than is usually employed and that coalugation basins as well as filters could be materially reduced in size. The chief object of the plant, therefore, aside from educating the public, was to determine the maximum rate of filtration that could be used, the necessary amount of preliminary sedimentation, and the most suitable kinds and amount of coagulant.

THE EXPERIMENTAL PLANT.

The experimental plant was operated continuously from October 1, 1917, to September 30, 1918. It had a capacity of approximately 200,000 gallons a day. It conmprised a mixing chamber, coagulation basin, two filter units, and a filtered-water basin, together with the necessary wash-water tank and coagulant mixing, storage and controlling devices. The plant was housed in a neat frame building shown in the accompanying illustration, located near the shore shaft of the ten-foot intake tunnel. Two 2-inch motor-driven centrifugal pumps raised the water from this tunnel directly into the mixing chamber, at the entrance to which the coagulant solution, flowing by gravity from orifice boxes on the floor above, was mixed with the raw water. The water thus treated flowed through the mixing chamber at a velocity of 0.66 foot per second, the chamber being divided by two longitudinal baffle walls so as to compel the water to flow three times its length, or thirty feet in all. The mixed water then entered the coagulation basin, which was twenty-five feet long and divided into three parallel channels, giving a flow of 75 feet and a retention period of one hour and forty-seven minutes and a velocity of flow of 0.71 foot per minute.

Each of the two filter units was four feet by six and about ten deep. The effective size of the sand in the east filter during most of the time was 0.40 m.m. and that of the west filter was 0.53 m.m. A wash-water storage tank of 2,500 gallons capacity was located in the third story of the building. The filters were designed to be washed at a high rate, using no air or other auxiliary means of agitation, but depending entirely upon the upward velocity of the wash-water through the bed of sand. It was found possible to use a rate of wash as high as 30.5 inches per minute without carrying away any of the filter sand.

Samples of raw, settled and filtered water were collected four times a day and tested for turbidity, alkalinity and bacteria, a total of 15,000 samples having been examined. The operating conditions were changed from time to time in order to obtain data for use in determining the most favorable procedure as regards time of mixings, period of sedimentation, rate of filtration, kind and amount of coagulant, rate of washing, and effective size of sand. The maximum turbidity of the raw water observed during the year of operation was 490 parts per million. At all times the effluent from the experimental filter was free from turbidity. Alum was used as a coagulant during the greater part of the test, the amount used varying from 0.41 grain per gallon to 0.91. Iron and lime were used for a part of six months, the amounts varying from 0.42 grains of iron and 0.65 grains of lime per gallon to 0.95 grains of iron and 1.14 grains of lime.

The number of bacteria was determined by making counts on gelatine plates incubated at 20 degrees and on agar plates at 20 degrees and 37 degrees centigrade. An average of the entire test gives, from gelatine test, 244 bacteria in raw water, 150 in settled water, and 50 and 55 in effluent form the east and west filters respectively. The 20 degree agar test gives the total bacteria as 417 in raw water, 269 in settled water, and 108 and 106 in the two filters; while the 37 degree agar gives 37 in raw, 27 in settled and six in each of the filter effluents. To determine the presence of B.coli, the so-called "partially confirmed test" was used. From these the following conclusions were drawn: B.coli in one c.c. of water was found 42 times in 648 samples of raw water, 28 times in 654 samples of settled water, no times in 968 samples of east filter effluent and twice in 804 samples of west filter effluent. In 10 c.c. of water, B. coli was found 257 times in 650 samples of raw water, 226 times in 654 samples of settled water, 113 times in 970 samples of east filter effluent, and 97 times in 805 samples of west filter effluent.

The average rate of application of wash-water to the east filter was 25 inches vertical rise per minute, and 30.5 inches for the west filter which contained the coarser sand. During the last month of the experiment, the rate of wash water to the west filter was reduced to 25 inches with no appreciable change in bacterial efficiency. The west filter was more easily operated than the east, the loss of head increased more evenly and washing was accomplished more satisfactorily. The coarser sand offered no more difficulty than the finer in permitting small amounts of flock to pass through the sand.

The rate of filtration was varied from a minimum of 157,000,000 gallons per acre per day to a maximum of 207,000,000 gallons. The number of bacteria in the effluent was lower with a rate of between 196,000,000 and 202,000,000 gallons than it was at any lower rates. The 207,000,000 gallon rate was used during a time when the number of bacteria in the raw water was greatest, and as a result the number in the filter effluent was also greatest during this time, but the percentage reduction of bacteria was twice as great as the average for the entire experiment.

Although the use of iron and lime as a coagulant was not continued for as long a time as was alum, it was given a thorough trial. The best results were obtained while using about 0.75 grain per gallon of iron and 0.55 of lime, or 107 pounds and 79 pounds respectively per million gallons. Based on normal prices, the cost of the alum delivered at the plant would be about the same as that of the iron and lime.

"Many cities use the iron and lime process because of the high temporary hardness of the raw water which they are obliged to treat, which hardness is reduced by the use of lime. However, the temporary hardness of the Detroit river does not warrant the use of lime for this purpose.

"It was found that the iron and lime process required more and closer attention to the plant to secure good results than did the alum process producing equally good or better results. Some trouble was experienced from clogging lime orifices, and the handling of even the small amount of lime required for the test plant created much objectionable dust.

"The handling of lime in large quantities is unpleasant work, requiring the use of masks by those employed in unloading it from the cars, and the installation of dust-proof mechanical transporting devices. The use of lime and iron would also require double sets of storage, mixing and solution tanks. To obtain the best results in lime slaking, considerable hot water is desirable. The labor charge would also be greater than when alum alone is used. With these facts in mind we have made our plans and estimates for a filtration plant with the

idea of using alum as a coagulant, believing it will be more satisfactory."

The construction of the mixing chamber and its location afforded an excellent opportunity to observe the process of mixing and the formation of flock. It was found that at the end of five minutes the flock was easily distinguishable and that at the end of ten minutes an excellent coagulation resulted, the flock increasing in size as it passed through the coagulation basin.

The filters were successfully operated for several weeks with less than one hour of sedimentation. There was an average removal of suspended matter of about 63 per cent while passing through the coagulation basin.

DESIGN OF PLANT.

The plan of the plant, designed to filter the entire supply of the city, provides for locating it on land directly in the rear of the present pumping station, which appeared to have only one objectionable feature, viz. that the soil is soft and wet and that all the structures will require pile foundations. It is proposed to use concrete piles in order to avoid possibility of the tops of the piles failing if they should not always be wet, and for greater convenience in anchoring the structures to the piles to overcome any tendency to floatation by the semi-fluid character of the surrounding material.

The capacity is based on an average consumption of 150 gallons per capita and a population of about 1,425,000, which is that anticipated by the year 1930. The site permits increasing the capacity by more than 50 per cent when this may become necessary. The rate of filtration assumed is 175,000,000 gallons per day per acre, although it is suggested that the filters can be used at a rate about 10 per cent higher if necessary.

There are two mixing chambers, each with a capacity of two million gallons, a retention period of thirteen minutes and a velocity of flow of 1.4 feet per second. There are six coagulation basins, each with a capacity of 4.35 million gallons, a retention period of two hours and a velocity of flow of three feet per minute. The sludge from the coagulation basins will be discharged through a drain to the river. Alum is to be used as a coagulant.

Each mixing chamber is 182 feet long by 68 feet wide. Alum is brought by rail to the east end of the coagulant house and raised by a conveyor to the storage bins. Dry alum is drawn from the bottom of these bins to conveyors, which carry it to weighing devices, which discharge it into the dissolving tank.

Each coagulation basin is 363 feet long by 103 feet wide, with the water 16 feet deep. Water pipes, carrying water under city pressure, will be built into the basins with connections for attaching fire hose for aid in cleaning the basins.

There are planned to be seventy-two rapid sand filters, each having an area of 1,286.8 square feet, or a sand area of 1,000 square feet. This gives a nominal capacity of each unit of four million gallons a day. The depth of filter gravel is 18 inches and of filter sand 30 inches, the effective size of the sand to be between 45 and 50 m.m. Water from elevated wash-water tanks will be applied at the rate of 25 to 30 inches of vertical rise per minute.

The filtered water reservoir has a capacity of 36,000,000 gallons. The plant provides for low-lift pumps with a total capacity of 365,000,000 gallons a day, a maximum suction lift of 7.7 feet and a maximum discharge head of 25.9 feet.

The estimate of cost is based on present prices, and it is suggested as possible that, before bids are received, there may be a considerable reduction in the prices of most of the materials. The total cost for all structures and superstructures, including outside pipe lines, and with ten per cent added for engineering and contingencies, is estimated at $5,868,000. The operating cost, based on a daily average pumpage of 250,000,000 gallons with one per cent used for wash-water, is estimated to be $145,700 per year for low-lift pumping, or $1.60 per million gallons pumped. The cost of operating the filtration plant is estimated at $187,625 per year or $2.06 per million gallons filtered; giving a total cost of pumping and filtration, corrected for the use of wash-water, of $3.69 per million gallons. Adding fixed charges based on 5 per cent thirty-year bonds gives a total cost of $7.91 per million gallons. When the plant is first put in operation and the average daily demand probably will not exceed 200,000,000 gallons, the unit charges are estimated to be $9.42 per million gallons.

SEWAGE DISPOSAL AT COLUMBUS

Some Features of Report for 1918—Purification Not Sufficient Under Summer Conditions—Tank Foaming—Filter Flies.

The issue of the City Bulletin (the official publication of the city of Columbus, Ohio) for April 26th contains the annual report of Jerry O'Shaughnessy, superintendent, and C. B. Hoover, chemist in charge, of the sewage disposal plant of that city.

Mr. O'Shaughnessy calls attention to the fact that the pollution of the Scioto river above the outlet of the disposal plant is so great that the addition of the disposal plant effluent produces an unsatisfactory condition, and urges that the state authorities eliminate the conditions that produce such pollution. Even with the practical elimination of other pollution, however, that of the sewage effluent would remain more serious than any of the others, since the average daily discharge of treated sewage is twenty million gallons, while the flow of the river reaches a minimum of five million gallons.

The figures given in the report show that for normal stages, and even for low stages of the river, when the water temperature is low, the treatment which the sewage receives is adequate to prevent exaustion of oxygen in the stream; but when the temperature is high, even with normal stages the treatment is insufficient if the period be protracted, and with high temperature and low stages, the oxygen in the stream is completely exhausted.

Comparing the stability values of the river, we find that above the works to be 74, seven miles below it is 73, eleven miles below it is 91, and reaches 100 at 16.3 miles. The stability value of the final effluent of the plant was only 31, which certainly would seem to be lower than good practice would call for under the condition of such a small degree of dilution.

The oxygen-consumed value of the river water above the plant averaged 8.7 parts per million, while seven miles below it this had fallen to 7.7; showing that, in spite of the addition of the sewage effluent, there was an improvement in this respect in seven miles of flow. In the next four miles the oxygen-consumed value fell to an average of 3.8.

Owing to the increase in the amount of sewage treated, which was about 12 per cent greater than in 1917 and about 70 per cent greater than in 1916, the average detention period in the tanks has fallen from 4 or 5 hours, which was the period from four to six years ago, to 2.8 hours. The total suspended solids removed by the tanks last year was only 37 per cent, as compared to the 40 to 60 per cent of from two to five years ago; while the

plant as a whole average 50 per cent removal of suspended solids as compared to 60 to 80 per cent a few years ago. Attention is called, however, to the fact that only 54 per cent of the weight of the total suspended solids were settleable, and that the tanks removed 69 per cent of such settleable solids. "The proportion of settleable to total suspended solids in the Columbus sewage we believe to be unusually low and that the subsidence of the solids of the sewage is unfavorably affected by long travel in the sewers and by action of the centrifugal pumps."

"Our experience with two-story tanks indicates that foaming is directly related to the need for sludge removable. The capacity of our sludge disposal facilities is just about adequate for a long, dry season. But if rains are at all frequent or any other condition obtains which interferes with the regular and continuous removal of wet and dry sludge, the successful operation of the tanks is very difficult."

The average cost of sludge removal was as follows:

	Per cubic yard Cents.
Labor	40.5
Gasoline	2.1
All other	1.2
Total	43.8

The labor amounted to 0.912 hours per cubic yard, and the mean labor cost per hour was 44.4 cents. The total number of cubic yards removed was 3241.3, and the average approximate length of haul was 750 feet.

On the sprinkling filters there were more flies this year than at any time during the previous three years. Also there was more unloading from the filters this year than at any time during the previous three years, which unloading lowered the percentage removal of total suspended solids. The settleable suspended matter in the filter effluent ran 1.53 c.c. per liter as compared with 1.08 c.c. in the tank effluent.

The sewage disposal plant represents bond issues totaling $1,550,000, on which there is an annual payment for interest and sinking fund of $94,115. A large part of the sewage needs to be pumped, and in 1918 this pumping cost $33,512. The sewage treatment cost $8,824, administration, $2,218, and night soil disposal cost $2,050; giving the total operating costs of $46,604. Adding the interest and sinking fund charges gives a total of $140,719. The amount of sewage pumped and treated was 4,570 million gallons, and the population was estimated at 226,000. This gave the total average cost of treatment, including pumping, $30.79 per million gallons; and the cost per capita per year 62¼ cents.

GOVERNMENT MACHINERY FOR STATE HIGHWAYS.

Under the federal road act amendments passed last winter, the Secretary of War was authorized to transfer to the Secretary of Agriculture, "all available war material, equipment and supplies not needed for the purpose of the War Department, but suitable for use in the improvement of highways"; these to be distributed among the highway departments of the several states, to be used on roads constructed in whole or in part by federal aid, on the same basis as the allotment of funds.

Some idea of the amount of equipment to be distributed may be gained from the fact that Wisconsin is to receive five hundred motor trucks, and a number of steam shovels, graders, tractors, trailers, ditchers, horses and mules, harness, explosives, tents, kitchen equipment and other contractors' supplies. Utah is to receive thirty trucks, four tractors, trailers, eight pavement mixers, four concrete mixers, twelve mess equipments, ten thousand feet of 2½ in. and 3 in. pipe, air compressor for drills, four steam shovels, twelve transits, twelve levels, etc.

The trucks to be distributed are said to include 6,000 2-ton trucks, and 5,000 two-ton quadruple drive, 8,100 3-ton trucks and 900 5-ton; of which 11,000 are entirely new.

The distribution of equipment costing more than one hundred million dollars should be of considerable assistance to the states and, combined with the reduction of 10 per cent in freight rates on road materials announced last month, should stimulate immediate and energetic beginning of state highway construction.

OKMULGEE'S WATER SUPPLY AND SEWERAGE.

Increasing Capacity and Purity of Water Supply—Constructing Sewage Treatment Plant and Reconstructing Sewerage System.

The city of Okmulgee, Okla., obtained preliminary plans for new and complete water and sewerage systems in the spring of 1917, and after submitting them to the United States Public Health Service, which recommended some changes, the proposition of issuing bonds for the construction of the work was submitted to the people and defeated. During the summer of 1918 additional engineering advice was secured and a new and more complete set of plans and specifications prepared, and in the latter part of September the issuing of bonds for construction upon the basis of these new plans was approved. Contracts were let shortly after for a sewage treatment plant and changes in the sewerage system and for reconstruction and rehabalitation of the waterworks, which work is now under construction and progressing very satisfactorily. The city is growing very rapidly, having something over one hundred new houses now under construction and the officials are already taking steps toward a new bond issue of $200,000 for further extensions and improvements. The plans under which construction is progressing were prepared by Burns & McDonnell as engineers.

Original Waterworks.—The original water supply system comprised an impounding reservoir formed by building a low dam across the Deep Fork of the Canadian river, two miles west of the city, which reservoir has a capacity of about 68,000,000 gallons; low-lift pumps which raise water from this reservoir into two settling basins, each with a capacity of about two million gallons; and high-duty pumps which force the settled water through a line of ten-inch pipe to a distributing reservoir located within the city; and, of course, a distribution system. The two settling basins at the river were used alternately and coagulating chemicals were added without any scientific control as to quantity. At the distributing reservoir, the water was treated with hypochlorite of lime fed by means of an orifice box. No bacteriological examinations were made of the water after treatment with hypochlorite and the efficiency of the treatment was doubtful. Moreover, during droughts the quantity of water available was insufficient for the increased population of the city.

Original Sewerage System.—The original sewerage system was built as a combined system, but without any general plan embracing the entire city; the result of which is that some mains are already too small for the areas served and others are laid at such elevation that new districts cannot be drained into them. The sewage is discharged untreated into the same stream from which the water supply is drawn, but below the waterworks

reservoir and about three miles from the center of the city.

NEW WATERWORKS SYSTEM.

The improvements to the waterworks system include raising the dam four feet and thus increasing the storage to 128,000,000 gallons, constructing an intake well in the reservoir, changing the low service pumping station and the piping connected therewith and the sedimentation basins, constructing a chemical house which will contain solution tanks, feed devices, mixing channels, etc., constructing an entirely new mechanical filter plant with about 4,000,000 gallons capacity and a clear well beneath the filters, and constructing an entirely new pump and boiler house and installing machinery therein, and finally laying a new 18-inch force main from the pumping station to the city.

Purification will be much more complete and scientific under the new plan. Baffles are being placed in one of the old sedimentation basins, which will give a twelve-hour period of sedimentation on the basis of 4,000,000 gallons consumption. As the water enters this basin, it is aerated by spraying it into the air and allowing it to trickle down over a series of platforms or steps. From the sedimentation basin the water passes through the chemical house, where coagulating chemicals are added, and then through duplicate mixing channels into duplicate settling basins, which were formed by reconstruction of the second of the old sedimentation basins. Each of these latter settling basins will have a capacity of about one million gallons.

The settled water will be filtered in a plant of four units, each with a capacity of one million gallons per day, equipped with hydraulically operated valves, rate controllers, loss-of-head gauges, automatic measurinig and recording devices and operating tables. The filters will contain 30 inches of sand with an effective size between 0.36 m.m. and 0.46 m.m. and a uniformity coefficient of not more than 1.65; this sand being supported on a 15-inch layer of graded gravel varying in size from one inch to about one-eight of an inch. These filters are being constructed by the Pittsburgh Filter Company.

The chemical house is equipped with dry-feed machines, solution tanks and measuring devices and will be so constructed and equipped that lime and iron, alum, or soda ash can be added as the coagulating chemicals. The plans include a space for a laboratory and the specifications call for a small amount of laboratory equipment for chemical examinations of raw and filtered water.

Effluent from the filters will be disinfected with liquid chlorine before passing into the clear-water reservoir, which has a capacity of 120,000 gallons or slightly less than one hour's supply. From the clear-water reservoir, water is pumped directly to the city without any further storage.

The new waterworks plant is being built around the old one, the latter being maintained continuously in operation at all times.

The cost of the work has been considerable, but it is not believed to be excessive considering the present high cost of labor and materials. The raising of the dam, constructing the intake well, pumping station and filter house, rebuilding the settling basin, etc., is costing $135,200; the filter equipment $46,200; one 3½ million-gallon direct-acting triple expansion pumping engine, with two boiler-feed pumps and two 150 H. P. water tube boilers, $33,400; a 48-inch by 100-foot chimney, $2,880. One 100 kva. engine generator set and switchboard cost $9,400. Miscellaneous installation work totals $25,400. Cast iron pipe and castings, fire hydrants, valves, etc., and the hauling and laying of the same totaled $134,637.

NEW SEWERAGE SYSTEM.

In improving the sewerage system, new mains will be laid which will take the sewage from existing districts on the separate system, and others which will serve districts as yet unsewered. An outfall sewer will be constructed to a point about one and a half miles south of the city, where the city has purchased about six and a half acres of land and where treatment works are under construction. The effluent from this plant will be discharged into the old outfall sewer and through it into the river as before. The changes in and additions to the sewerage system are estimated to cost $65,756 and the sewage treatment works to cost $69,000.

At the treatment plant the sewage first enters a screen chamber and pump pit, the topography requiring the raising of the sewage about twenty feet in order to carry it through the treatment plant by gravity. The screens consist of bar screens with three-quarter-inch openings. The sewage is lifted by three electrically driven centrifugal pumps, each with a capacity of 500 gallons a minute, operated automatically by floats in the pump pit.

After screening and pumping, the sewage passes into Imhoff tanks, from these to a dosing tank and thence to sprinkling filters. Two sludge beds are provided for receiving the sludge from the Imhoff tanks. The plant is so laid out as to provide space for duplicating the Imhoff tank installation and also that of the sprinkling filters.

The original surface of the ground is about elevation 51, the Imhoff tanks reach a maximum depth of elevation 41 and the walls extend to elevation 65.86, while the sewage level is three feet below this. The dosing tank is set to discharge when the Imhoff effluent reaches elevation 62.61, the water falling in this tank to elevation 57.61. The top of the stone in the sprinkling filters is 54.61, thus giving a head varying between eight and three feet for operating the sprinklers. The bottom of the sprinkling filter is about elevation 48. It appears from these figures that the Imhoff tanks, although about twenty-five feet deep, require only ten feet of excavation, and that the bottom of the sprinkling filter is only three feet below the original ground surface. The material excavated will be used in banking around these elevated structures.

The Imhoff tanks are two in number, each tank containing two settling apartments. The combined capacity of the four settling compartments is 97,000 gallons, thus allowing a detention period of three hours when both tanks are in operation. The tanks are formed with the customary hopper bottoms, each tank containing four hoppers and having a total length of 72 feet and a width of 17½ feet. There is a continuous gas vent two feet wide between the two settling channels, and another continuous vent twelve inches wide between each settling channel and the outside wall of the tank. This furnishes an area of gas vent nearly one-fourth of the entire area of the tank. The sludge pipes are vertical for a height of about twelve feet, where the horizontal sludge pipe branches off, the vertical sludge pipes being continued vertically through the gas vents to the top of the tank for cleaning-out purposes. The slopes of the hopper bottoms are approximately one to one and those of the settling chambers one to one and a half. Provision is made by channels and stop-boards for reversing the flow through the tanks. The sewage enters and leaves the tanks over weirs thirty inches wide, of which there are four at each end, both sets of weirs being protected by baffles for retaining the scum.

There are two sludge beds, each eighty feet by forty feet and containing six inches of filter sand, under-

drained by six to twelve inches of gravel. The floor of each bed slopes toward five lines of six-inch underdrains, which discharge into a main eight-inch collector across one end of the bed. The total area of the sludge beds is 6,400 square feet, thus allowing two and a half persons per square foot of surface.

The sprinkling filter now being constructed is 148 feet by 103 feet in total area. The sprinkler heads are set checker-board fashion, nine feet apart. They are fastened to the tops of three-inch galvanized iron risers which are fed by eight-inch lateral distributors, the latter being imbedded in concrete a few inches above the bottom of the filter basin. The eight-inch lateral distributors are in turn supplied through a 24-inch main distributor. The drains terminate at their upper ends in vent chambers, from which chambers rise eight-inch sewer pipe vents with elbows at their upper ends. The main underdrain is constructed with 15-inch split sewer pipe, and the lateral drains consist of 6-inch split tile laid with half-inch open joints in parallel lines ten inches between centers. Inspection manholes are placed at each end of the main drains and at the upper ends of the tile drains.

Broken stone varying in size from three-quarters of an inch to two and a half inches will be used as filtering material, the depth of the stone varying from five to six feet.

This plant is designed to treat 750,000 gallons a day, measurements of the sewage from the city indicating that it now averages 500,000 gallons, with a maximum of 700,000 and a minimum of 200,000.

BRICK PAVEMENTS

Conditions of Some Pavements in the Middle West and Conclusions Drawn by Engineers of the Bureau of Public Roads.

Two engineers of the Bureau of Public Roads, A. T. Goldbeck, engineer of tests, and F. H. Jackson, assistant testing engineer, a short time ago made an inspection of a large number of brick roads in the middle western states, and their report on the facts learned and conclusions drawn have recently been made public by the bureau. The inspection extended over city streets and county highways in the states of Ohio, Indiana, Illinois, Iowa, Missouri and Nebraska.

"One of the outstanding results was the remarkable state of preservation of roads that had been under traffic for from twenty to twenty-five years." Most of the older pavements in Cleveland were laid on a natural soil foundation, which consists mainly of fine sandy loam. Most of these are in good condition and such longitudinal cracks as have formed are probably the result of poor drainage. It was stated that about 75 per cent of the brick streets of this city are laid on natural soil foundation. A number of brick streets laid about 1900 were examined and were found in very good condition with one exception. The use of a poor grade of brick on one street, although laid on a six-inch concrete base with a two-inch sand cushion, resulted in pockets varying in size from less than a square foot to one or two square yards. One very old sand-filled pavement made with building-size brick was in splendid condition after about twenty-five years, showing no appreciable wear except that the edges of the brick were somewhat worn and rounded.

On the Cleveland-Akron road, the greatest number of failures were found on a section which had been laid on a rolled slag base, probably due to the overloading of the base by traffic at a time when the earth foundation was saturated with water. On the Cuyahoga county roads the outstanding features noted were the large number of longitudinal cracks (presumed to be due to the moisture-retentive soil), and also the typical failures due to the sand cushion working up into the joints during construction, resulting in imperfect grouting.

Of the brick streets in Conneaut, Ohio, Main street was of peculiar interest because of the fact that it was laid about twenty-five years ago and has been continuously subjected to a considerable amount of traffic. In this city a failure was being uncovered which was found to be due to the fact that, when constructing the concrete base, this had been left sloping at the end of a day's work instead of with a vertical face, and expansion had caused the adjacent section of concrete base to slide up over this sloping face, of course carrying the brick up with it, the moving section having risen about two inches higher than the other. A semi-monolithic pavement was found to have heaved three inches in the center, causing a wide longitudinal crack, while there was very little vertical movement at the sides, these facts having been determined by actual leveling. This was believed to be due to the fact that uncompacted snow at the sides of the road prevented the penetration of frost to as great a depth there as at the center. The city engineer, to confirm this theory, determined the frost penetration and found it to be greater at the center of the pavement than at the sides.

Near Sterling, Ill., was found a road 16 feet wide constructed on a gravel base with a one-inch cement-sand cushion and four-inch wire-cut lug brick, laid in the summer of 1917. There is moderate traffic with occasional heavy loads. The surface was in excellent condition, with no indications of settling of the brick. There were some transverse cracks, but no longitudinal ones. The subgrade is a fine black loam and there was no tile drainage.

A number of other interesting features were observed in the various sections visited, such as the movement of pavements away from the curb on the inside of curves, the relative condition of asphalt and cement joints in the same street, conditions of pavement with sand cushion, cement-sand and monolithic, methods of laying brick in passing around curves, etc.

IMPORTANCE OF SUBGRADE.

The authors give a number of conclusions which they have drawn as a result of their observations and investigations, and among these is the important part that the subgrade or soil plays in the life and wear of a pavement. They concluded that it plays a very important part in the formation of longitudinal cracks, and that it is very important that a thorough study be made of the underlying soil and the drainage conditions before attempting to design a road for a particular locality. A thorough study of capillarity and the methods of draining various kinds of soils they believe to be essential to improvement in pavement construction. The nature of the subgrade should be considered in designing the base, since it is perfectly obvious that the character of the subsoil which supports the foundation and the character of the loading transmitted through the wearing course to the foundation are the two important factors in designing the base. A subgrade which is very soft, such as a clay saturated with moisture, would require a much thicker base than one which is always exceedingly firm and unyielding. At the present time the exact distribution of the reaction against the under side of a concrete base or slab is unknown and

will have to be determined by suitable tests. At present, therefore, the proper thickness of the base must be based on precedent.

THICKNESS OF BASE.

It would seem from the results of observations that the present-day heavy traffic can be carried safely on a four-inch concrete base with a four-inch brick wearing course when monolithic construction is used and the subgrade conditions are favorable; but that the thickness of the base be increased along any stretch where subbase conditions are open to question. On every heavily traveled city street, also, the concrete base should be thicker. When sand cushion construction is used with grouted brick surface, a six-inch concrete base should give good results under heavy traffic, with an increase in thickness over soft spots in the subgrade. If a bituminous filler is used in the brick wearing surface, theoretically the concrete base should be thicker than in the case of a grouted surface, but in the absence of test data it is impossible to state how much thicker.

The authors express their disapproval of bricks without lugs in that it is much more difficult to obtain joint spacing of sufficient and uniform width to permit of good grouting. The bar lugs which are commonly found in vertical fibre bricks too greatly reduce the area of cement in joints, in their opinion. The wire-cut-lug brick they report to have gained greatly in popularity since they were first introduced, one advantage being the square edge as compared with the rounded edge of repressed brick, and another being the roughness of the joint face which facilitates the adhering of jointing material.

JOINT FILLERS.

Concerning the use of bituminous and of cement fillers, the writers make the following remarks:

Although there is considerable opposition to the general use of bituminous fillers for brick pavements, good results in using asphalt have been obtained in certain cities west of the Mississippi as has been previously noted. The principal disadvantage of bituminous fillers appeared to be the lack of protection afforded the brick at the joints; moreover they do not give any slab strength to the brick surface. The former fact was noted in a number of cases on old bituminous filled streets in which the edges of the brick have worn badly. The relative action of traffic on bituminous filled and grout filled joints was noted on those streets where expansion joints consisting of a number of courses of bituminous filled brick had been installed. The difference in wear was very noticeable.

Another disadvantage of bituminous fillers is the tendency, particularly noted in tars, of running out at the sides of the road in hot weather or chipping in cold weather. They possess still another disadvantage of requiring constant attention at the time of application to insure that the temperature of the bituminous material remains at the proper point; since, if too cold, they will bridge the joints instead of penetrating, and, if too hot, they will become hard and inert. On the other hand, they possess the undoubted advantage of being free from expansion troubles. They likewise make a somewhat quieter pavement.

The ease of making service cuts in city streets through this type of pavement is another advantage.

It should be emphasized that when a bituminous filler is used particular care should be taken in its selection in order to avoid the troubles incident to ill-suited materials. In those asphalt filled streets examined in the cities west of the Mississippi, it was noted that by the use of considerable excess of bituminous material a wearing mat of appreciable thickness was formed over the surface of the brick pavement. This mat apparently remains for some years, depending upon its thickness and the character and volume of traffic, and while still intact undoubtedly protects the brick from the action of traffic to a very large extent. This probably is the reason brick streets in this section have worn so little.

CONCLUSIONS.

The authors have drawn the following conclusions as a result of their study of brick pavements:

1. The type and thickness of base for any brick pavement should depend upon (a) the maximum weight of the loads to be carried, and (b) the bearing value, under all weather conditions, of the underlying soil.
2. In all cases where the traffic to be carried is likely to be heavy or where the underlying soil is of such a nature that its bearing value is not sufficient to support the pavement under all conditions, a concrete base of sufficient thickness to properly distribute the loads should be provided.
3. Where the maximum weight of the loads to be carried is not excessive and the subsoil is of a porous well-drained nature, the thickness of the concrete base may be decreased or, under very favorable conditions, it may even be omitted altogether.
4. Other things being equal a somewhat lighter construction may be permitted in the case of the "monolithic" and "semimonolithic" types than where the ordinary sand cushion type is provided, on account of the increased slab strength which these types appear to possess.
5. A concrete curb or edging is not necessary when "monolithic' 'or "semimonolithic" construction is used.
6. Paving brick with well-formed contact lugs are to be preferred to brick without lugs.
7. Paving brick with square edges are to be preferred to brick with rounded edges.
8. Given the requisite care in construction, satisfactory results may be obtained with either cement grout or bituminous filler.
9. Vertical fiber lug brick with bituminous filler have given good service in those cities west of the Mississippi where they were inspected, possibly due to the protecting action of the asphalt mat which prevents wear from coming upon the brick direct.
10. Expansion joints in grout filled pavements would seem advisable at street intersections and at points of tangency on curves, and longitudinal points should be used against all rigid curbs or structures.

MIAMI FLOOD CONTROL WORKS.

Investigations made by the engineering staff of the Miami Conservancy District include a number of subjects that are of general interest to engineers, and the plans for the flood control work form an important chapter in the development of that branch of engineering. The district has published six reports describing the development of the project and features and investigations of importance, and has six others in preparation. These are sold at 50 cents to $1.50 each, and are well worth the price, containing from 111 to 310 pages of most instructive matter.

The reports include one giving the story of the Miami Valley flood, another describing the control projects, another giving the contract forms and specifications, with detail drawings; while others give the results of investigations of "Hydraulic Jump and Backwater Curves," "Calculation of Flow in Open Channels," and "Storm Rainfall of the Eastern United States." Reports in preparation cover hydraulic and structural design of the protection system, laws, appraising benefits, construction plants, etc. These reports can be obtained from the Miami Conservancy District, Dayton, O.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading ones published in other countries, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on muncipal matters. In further ance of this we will furnish any of the articles listed in the index for the price named after each article, except that where issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

ROADS AND STREETS.

Highway Finances:

Financing Highway Improvements. Life of a loan should be that of the road; payment by annual appropriations; parties interested in road financing. Report to American Road Builders' Ass'n by committee of which Nelson P. Lewis is chairman. 2,100 words. Municipal Journal and Public Works, Apr. 19. 10 cts. 3,200 words. Good Roads, Apr. 26. 10 cts.

Hundreds of Millions for Roads. Amount limited almost entirely by what can be done and not by the money needed to pay for it. 150 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

The Present Level of Prices, with Special Reference to Prices of Road-Making Materials. Suspicion of prices; views of an eminent economist who believes prices are on new and permanently higher level. Address at Conference of Governors and Mayors at Washington, by S. M. Williams, pres. Highways Industries Ass'n, Washington, D. C. 2,600 words. Municipal and County Engineering, April. 25 cts.

Why Illinois Shows Wisdom in Not Waiting for Road Material Prices to Decline. Substantial reduction not to be expected this year; preferable to provide jobs for idle men than to wait for problematical reduction. 700 words. Engineering and Contracting, Apr. 16. 15 cts.

Cost Keeping for Highway Contractors. Suggestions for making daily estimates of unit costs; daily overhead; installing and shifting plant. Paper before American Road Builders' Ass'n, by H. P. Gillette. 2,800 words. Good Roads, Apr. 19. 10 cts.

Highway Work Contemplated for 1919. Nearly $400,000,000 already available, and more than $100,000,000 assured for road work this year. 2,000 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

Contracts and Labor:

What Kind of Contracts? Editorial discussion of vital question; lump sum method most commonly used, but has obvious weaknesses; cost-plus contract indorsed by Brig. Gen. Marshall, chief of construction division of War Dept. 800 words. Good Roads, Apr. 19. 10 cts.

Comparison of Long and Short Highway Contracts. Opportunity for both; outgrown methods should be discarded; long contracts cheaper and desirable to attract large construction organizations. By H. Eltinge Breed, first deputy commissioner of highways, N. Y. S. 1 ill., 3,200 words. Engineering News-Record, Apr. 24. 20 cts.

Unit Price and Cost-Plus Systems of Contracts for Public Work. Our old friend, "liquidated damages"; how should damages be computed; must not censor expenditures. By A. W. Graham, from paper before the Chicago Road Congress. 2,000 words. Canadian Engineer, Apr. 10. 15 cts. Engineering and Contracting, Apr. 2. 15 cts.

Efficient Methods of Contracting for Highway Work During the Reconstruction Period. Brief outline of methods of contracting that have heretofore prevailed; no method that will apparently offer improvement upon lump sum form of bid. By John H. Gordon, pres., New York State Road Builders' Ass'n, paper presented at convention of the American Road Builders' Ass'n. 1,400 words. Good Roads. Apr. 5. 10 cts.

Ohio Uses Cost-Plus-Lump-Sum Contract for Highway Maintenance. Schedule of bids on contract for road reconstruction. 500 words. Engineering News-Record, Apr. 10. 20 cts.

Piecework Faster Than Day Labor on Hand Excavation. Greater yardage per man recorded in California on both road and irrigation work; station gangs used on piecework. By Everett N. Bryan, chief engr., Waterford Irrigation District, Waterford, Calif. 800 words. Engineering News-Record, Apr. 10. 20 cts.

Day Labor, Force Account and Bonus System in Highway Work. Concensus of opinion of great number of highway engineers that day-labor system has become unpopular and has the name of being costly without the advantages claimed by the contract system. By Chas. M. Upham, chief engr., Delaware State Highway Dept., from paper before Chicago Road Congress. 2,000 words. Engineering and Contracting, Apr. 2. 15 cts.

Labor Efficiency Good on Percentage Contracts. Carefully kept figures on peace-time construction contradict common charge against this form of contract; inefficient laborers rather than type of contract cause of trouble on war construction. By H. C. Turner, pres., Turner Construction Co., N. Y. 3,700 words. Engineering News-Record, Apr. 24. 20 cts.

Convict Labor on Highway Work. Extracts from a report at the American Road Builders' Ass'n by a committee of which G. P. Coleman, Virginia state highway commissioner, is chairman, summarizing the practice of various states in the use of convict labor on highway construction. 1,000 words. Engineering and Contracting, Apr. 2. 15 cts.

Convict Labor on State Highway in California. Interesting information given in first biennial report of the California Highway Comn. 4 ills., 3,000 words. Engineering and Contracting, Apr. 2. 15 cts.

Designing and Theory:

The Importance of Adequate Drainage and Foundation for Road and Street Surfaces. Points to be given consideration are travel and traffic to be carried, character of subsoil, drainage (natural or artificial), climate, location and material available. By Clifford Richardson, engr., The Barber Asphalt Paving Co., Woolworth bldg., N. Y. C. 5,000 words. Municipal and County Engineering, April, 25 cts.

The Alignment of Roman Roads. Giving the author's idea of the method followed by the Romans in aligning their roads. Letter by Reginald Wellbye to The Surveyor of Oct. 4, 1918. 600 words. Engineering and Contracting, Apr. 30. 15 cts.

Construction of Highways in Cuts. Modification of the ordinary treatment being adopted more or less widely where hard surface pavements are used; most striking feature the elimination of shoulders and gutters. 1 ill., 300 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

Provincial Highway Surveys. Three commendable methods of procedure briefly outlined; careful inspection necessary; location of centre line; trial line sometimes necessary; reading and recording angles. By John T. Ransom, surveyor, dept. of public highways, Ontario. 5,000 words. Canadian Engineer, Apr. 10. Canadian Engineer, Apr. 17. 15 cts.

Elimination of Dangerous Road Junction and Its Cost. Deep rock cut and fill improve conditions; traffic maintained by sectional building; special drainage system installed. By Eugene Gedney, Nyack, N. Y. 3 ills., 1,700 words. Engineering News-Record, Apr. 3. 20 cts.

Considerations Affecting Design of Heavy Traffic Highways in Ontario. Motor traffic leads to stronger highways; thickness of road crust; shearing forces. By W. A. McLean, deputy minister of highways, Toronto, Ont. 2,000 words. Municipal and County Engineering, April. 25 cts.

Road Design and Regulation of Traffic. Discussion of principles to be considered before any rational progress can be made; past experience of little value under present conditions. By H. J. Fixmer, paving engr., board of local improvements, Chicago. 2 ills., 4,000 words. Engineering and Contracting, Apr. 2. 15 cts.

Regulating Truck Weights and Sizes. Editorial comment on the bill agreed on by the Pennsylvania state administration and Motor Federation. 200 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

Damage to Road Surfaces by Heavy Vehicles. Principal causes to which damage can be ascribed. From The Engineers, Feb. 21. 1,500 words. Engineering and Contracting, Apr. 30. 15 cts.

Maintenance:

Road Maintenance in Rural Areas. Use of refuse destructor clinkers in road work; effect of climatic conditions on road surfaces; tarring surfaces of constructed roads. From Journal Institution of Municipal and County Engineers, by James A. Webb. 1,400 words. Engineering and Contracting, Apr. 30. 15 cts.

Maintenance Data on Twenty-eight Sections of Test Road. Accurate records kept by Philadelphia show relative cost for various types; traffic census of roads. 1,700 words. Engineering News-Record, Apr. 3. 20 cts.

Maintain Earth Roads by Patrol Contracts in Kansas. State highway department has general supervision but lacks power of initiation; machinery counteracts labor shortage. 1,000 words. Engineering News-Record, Apr. 3. 20 cts.

Special Motor Equipment Used on Road Maintenance. North Carolina highway department has combination truck and tractor to plow, drag and transport materials and men. By D. H. Winslow, state maintenance engr., Raleigh, N. C. 3 ills., 800 words. Engineering News-Record, Apr. 17. 20 cts.

Army Work:

Military Roads as Constructed and Projected by the Construction Division, War Department, U. S. A., in 1918. Materials of construction; cost plus contracts commended; costs; abstracts from "Instruction to Constructing Quartermasters." 2 ills., 2,000 words. Municipal and County Engineering, April. 25 cts.

23rd Engineers Being Held to Repair French Roads. Gen. Pershing carrying out policy insisted on by French government; Gen. Black urges patriotic acceptance of situation. By Wingrove Bathon, Washington representative of Engineering News-Record. 2,300 words. Engineering News-Record, Apr. 24. 20 cts.

Road Building at Army Camps. Summary of work of the construction division of War Department in 1918. By Daniel B. Goodsell, highway engr., construction division, U. S. War Department. 3 ills., 3,000 words. Good Roads, Apr. 12. 10 cts.

National Highways:

National Roads. Argument in their favor based on success of national administration of French roads; necessary for interstate routes. By Maj. E. A. Kingsley, engr., U. S. A. 2,200 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

A National Highway as a National Monument of Peace. Republication of an article which appeared in this journal in May, 1917, urging the building of a transcontinental highway across Canada as a memorial to our soldiers. By the editor. 1,600 words. Canadian Municipal Journal, April. 20 cts.

National Highways. Benefits of a national highway system; political or spiritual and military benefits; extent and administration of system. Committee report at American Road Builders' Ass'n. Edward J. Mehren, chairman. 2,300 words. Good Roads, Apr. 19. 10 cts.

Brick Paving:

Developments in Brick Paving. Construction with sand cushions, cement mortar beds, and green concrete foundation. By Maj. Wm. M. Acheson, paper before American Road Builders' Ass'n. 2,800 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

Present Status of Brick Pavements Constructed with Sand Cushions, Cement Mortar Beds and Green Concrete Foundations. By Maj. W. M. Acheson, div. engr., N. Y. State Commission of highways, paper presented at the convention of the American Road Builders' Ass'n. 2,800 words. Good Roads, Apr. 5. 10 cts.

The Construction of Modern Brick Pavements. The relative value of sand cushions, cement mortar beds and green concrete foundations. By Maj. W. M. Acheson, div. engr., N. Y. State Commission of Highways. 3 ills., 2,000 words. American City, April. 35 cts.

Present Status of Brick Pavement Construction. Advantages and disadvantages of old and new methods; description of three different types. By Maj. Wm. M. Acheson, div. engr., N. Y. State Highway Comn., paper before convention of American Road Builders' Ass'n. 2,200 words. Engineering and Contracting, Apr. 2. 15 cts.

Concrete Pavements:

Machine Finishing Concrete Roads. Three methods of reducing voids in concrete; effect of excess water; mechanical compacting of concrete; conrete road finishing mahine. By E. G. Carr, Lakewood Engrg. Co., Cleveland, O. 5 ills., 1,500 words. Municipal and County Engineering, April. 25 cts.

Reinforcing System and Concreting Machine for Reinforced Concrete Roads. Two features of interest in connection with concrete road construction by the Port of London, designed by J. H. Walker of the Port Authority. Description abstracted from Concrete and Constructional Engineering. 2 ills., 500 words. Engineering and Contracting, Apr. 30. 15 cts.

Tamped Concrete Specified for Illinois Roads. Requirements controlling quality of workmanship made more rigid; increase in machine operations encouraged. 800 words. Engineering News-Record, Apr. 10. 20 cts.

Concrete Pavements for Mountain Roads. Instructions issued in 1917 by the California Highway Commission to its division engineers giving tentative sections for concrete pavements on mountain highways. 1 ill., 600 words. Engineering and Contracting, Apr. 2. 15 cts.

Other Pavements:

Road-Oil Heating Plant of Los Angeles County. Road department builds plant from old equipment in stock; installation saves county $20 per 1,000-gallon tank. By E. Earl Glass, Monrovia, Calif. 3 ills., 1,600 words. Engineering News-Record, Apr. 10. 20 cts.

Cement-Concrete Base Proportions for Bituminous Pavements. One of three methods suggested: a richer concrete base, a thicker concrete base, a richer and thicker concrete base; 1:3:6 concrete generally accepted standard. By W. L. Hemplemann, engr., Asphalt Sales Dept., The Texas Co. 600 words. Canadian Engineer, Apr. 24. 15 cts.

Some Specific Suggestions on the Design and Construction of Modern Wood Block Pavements. Pavement base; pitch coat; treatment of creosoted wood block; advantages of lug block. By E. A. Fisher, city engr., Lakewood, O. 4 ills., 1,700 words. Municipal and County Engineering, April. 25 cts.

Improvements of the Embarcadero in San Francisco. Bituminous concrete strip and wide basalt block pavement provide for light and heavy vehicles on waterfront thoroughfare. By Chas. W. Geiger. 3 ills., 500 words. Good Roads, Apr. 19. 10 cts.

Hay-Tar Roads in Wisconsin. Experimental road in Wisconsin after 12 months of service; commission does not recommend this type where it is possible to obtain local clay or gravel. 1 ill., 500 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

Street Details:

Saving Shade Trees. Comparisons between efforts made by the Street Maintenance Department of Los Angeles to save shade trees, and refusal of Iowa City to spare line of full-grown trees because of requirements of ordinance. 150 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

The Classification and Census of City Trees. Methods of readily recording condition of trees. By Albert F. W. Vick. 2 ills., 1,000 words. American City, April. 35 cts.

Buried Streets of San Francisco. Part of the city extends into a country of sand dunes, the continuous shifting and irresistible progression of which is one of the most serious problems the city has to face. 2 ills., 300 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

The Michigan Avenue Improvement. Is the most important addition to Chicago's boulevard system. By Hugh E. Young, engr. of bridge design, Chicago. 7 ills., 3,500 words. Engineering World, Apr. 15. 15 cts.

Set-Back Lines in Newton. Edwin H. Rogers, city engineer of Newton, Mass., in his annual report, makes brief mention of policy adopted in 1917. 300 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

General Problems and Aspects of Grade Separation. Extracts from a report by the Division of Grade Separation and Bridges, of Detroit, Mich.; grade separation and city planning; grade separation by depression or elevation of street. 4,000 words. Engineering and Contracting, Apr. 16. 15 cts.

Avoiding Duplicate Street Names. Newton, Mass., has 367 duplications of names; resolution passed relative to naming new and renaming old streets in honor of residents who lost their lives in the war. 200 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Miscellaneous:

The Future of Highway Transportation. Editorial discussion of what it will mean five or ten years from now; little doubt in short-haul work; long-haul business will depend upon relation of costs; responsibility of highway engineers. 1,100 words. Good Roads, Apr. 12. 15 cts.

Good Roads Propaganda by Government "Movies." Visual instruction section of the Department of the Interior to distribute slides and films of American and foreign road work. 500 words. Good Roads, Apr. 12. 10 cts.

The Highways of the Future. The "imaginative" road, or a dream of what our roads will be in 10 or 20 years from now; the "speculative" road, or what we estimate they will be based on past experience. From paper before the Joint Highway Congress, Chicago, by H. G. Shirley, secy., Highway Industries Ass'n. 2,400 words. Engineering and Contracting, Apr. 2. 15 cts.

Tabulated Highway Data: Facts and Figures Furnished by County Highway Officials Especially for This Issue. Bridge failures; county work; results of heavy traffic; pavement guarantees; contract work. 10 pages tables. Municipal Journal and Public Works, Apr. 19. 10 cts.

Earth-Moving Methods and Equipment for Road Construction. Hand shovels, barrows and carts; cost of grading with slush-scrapers; method of grading with road-grader or road scraper. From paper before meeting of County Road Superintendents and Engineers of Ontario, by A. R. McVicar, 1,100 words. Engineering and Contracting, Apr. 2. 15 cts.

Core Drilling Outfit for Test Specimens from Pavements. Employed by the testing division of the California Highway Commission for securing test samples from finished pavements. 2 ills., 400 words. Engineering and Contracting, Apr. 2. 15 cts.

To Supervise Federal Aid Road Work. Thomas H. MacDonald appointed by Secretary of Agriculture for this work; now chief engineer of Iowa State Highway Commission. 150 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

Snow Fences. Brief description and illustration of snow fence on Lincoln highway constructed by the State Highway Department of Pennsylvania. 1 ill., 250 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

SEWERAGE AND SANITATION.

Sewer Construction:

Equipment and Methods Employed in Building Sewers in San Francisco, Cal. Sewage discharged only at points where there are strong tidal currents; great deal of the work done on busy streets, involving handling flow of existing sewers. By H. W. Shimer, ass't city engr., San Francisco. 18 ills., 2,700 words. Municipal and County Engineering, April. 25 cts.

Construction of Long Outfall Sewer Under Unusual Conditions. Description of construction at Columbia, S. C., by city force under direction of city engineer, by which $35,000 was saved. By T. Keith Legaré, city engr. 4 ills., 900 words. American City, April. 35 cts.

Drains in Sewer Construction. Use of drains as method of removing ground water from trenches during construction of sewers has been developed in San Francisco with some details a little out of the ordinary. 2 ills., 300 words. Municipal Journal and Public Works, Apr. 2. 10 cts.

Segment Blocks Have Advantages on Larger-Size Drains. Lightness, ease of handling, and small breakage are a few of the desirable characteristics; trouble with unstable soils. By D. L. Yarnell, senior drainage engr., Bureau of Public Roads and Rural Engrg. 1,300 words. Engineering News-Record, Apr. 3. 20 cts.

The Columbia Outfall Sewer. The South Carolina city constructs its own installation; built partly on concrete trestles and partly through solid rock; work done cheaper than if performed under contract. By T. Keith Legaré, asso. mem. A. S. C. E., city engr., Columbia, S. C. 3 ills., 900 words. Fire and Water Engineering, Apr. 2. 15 cts.

Sewage Treatment:

The Disposal of Sewage by Treatment with Acid. The Miles Acid Process. Paper presented Jan. 22 by Edgar S. Dorr and Rob. Spurr Weston, of Boston, Mass., followed by discussion. 11,000 words. Journal of the Boston Society of Civil Engineers, April. 50 cts.

Design Features of Sewage Disposal Plant at Industrial Housing Development of the Alan Wood Iron and Steel Co., at Swedeland, Pa. By Geo. L. Robinson, consulting engr., 37-39 E. 28th St., N. Y. C. 1 ill., 900 words. Municipal and County Engineering, April. 25 cts.

Use of Sludge as a Fertilizer. Efforts, experiments and results obtained in disposing of sludge produced at the works of which the author is in charge. By F. T. Hambleton, from the Surveyor, Dec. 20. 1,000 words. Engineering and Contracting, Apr. 30. 15 cts.

Grit Chamber and Fine Screens for Part of New York Sewage. First plant to treat sewage from Manhattan borough; eductors clean grit chambers; two 14-foot Riensch-Wurl screens. By Chas. E. Gregory, engr. of drainage and sewage disposal, Manhattan, N. Y. C. 3 ills., 1,200 words. Engineering News-Record, Apr. 3. 20 cts.

Chlorination of Sewage. Tests at New Haven on crude sewage, screened sewage, and the effluents from Imhoff and activated effluent. 1,500 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

Chlorination of Sewage. Tests at New Haven on crude and screened sewage and the effluents from Imhoff tank and activated sludge process. From Municipal Journal and Public Works. 800 words. Canadian Engineer, Apr. 24. 15 cts.

Sewage Disposal by Dilution, Including Chlorination of Sewage Effluent and Treatment of Sludge. Analyses of crude sewage after passing through grit chambers and tank effluent after chlorination; effect of sewage effluent upon river water. By W. C. Easdale, from The Surveyor, Mar. 21. 2 ills., 4,500 words. Engineering and Contracting, Apr. 30. 15 cts.

Sanitation:

Typhoid in the Large Cities of the United States in 1918. Continued downward trend in majority of cities of more than 100,000 population; eight cities under 3 per 100,000. 1,000 words. Engineering News-Record, Apr. 24. 20 cts.

Malaria Control at Nitrate Plant. Mosquito eradication by clearing, drainage and oiling water surfaces reduces

disease 95% in Alabama district. By W. G. Stromquist, sanitary engr., U. S. Public Health Service, Florence, Ala. 5 ills., 1,400 words. Engineering News-Record, Apr. 10. 20 cts.

Army-Trained Health Officers for Cities. Medical department includes medical and non-medical men well trained for positions of public health. By A. W. Hedrich, editor, American Journal of Public Health. 500 words. American City, April. 35 cts.

Pollution of Boundary Waters. Report of the International Jont Commission formed to investigate this matter; elaborate reports issued, prepared by experts; United States suggested and Canadian Government concurred in asking for recommendations. 1,600 words. Fire and Water Engineering, Apr. 2. 15 cts.

Miscellaneous:

Milwaukee Sewage Pumping Station. Description of new automatically controlled system; disposal plant for treating a daily flow of 130 million gallons of sewage; three pumps with 30 million gallons capacity each. By T. Chalkely Hattan, chief engr. sewage commission. 3 ills., 600 words. Fire and Water Engineering, Apr. 23. 15 cts.

Testing a New Flush Tank. Description of experiments conducted by W. T. Knowlton, engr. of sewers, Los Angeles. 2 ills., 1,000 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

Cast-Iron, Wrought-Iron and Steel Pipe for House Drainage Purposes. Findings and conclusions reached in an investigation of relative life, deterioration by corrosion, and other characteristics of pipe materials used in main drainage, soil and vent system of buildings. By Paul Gerhard, D. Engr., C.E., consulting engr., New York, abstracted from Journal of Franklin Institute. 8 ills., 2,500 words. Engineering World, Apr. 1. 15 cts.

Municipal Aid for Private Plumbing. Two recommendations intended to aid the poorer property owners in observing laws for proper sanitation in their buildings, are contained in the report for 1918 of the Division of Health of Toledo, O. 400 words. Municipal Journal and Public Works. Apr. 5. 10 cts.

Los Angeles Sewerage. Operation of Imhoff tanks and other types of sewage treatment plans, purchasing sewer pipes, measuring sewage flow, testing flush tanks and general sewer maintenance. 1,300 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

Santa Rosa's Sewerage and Water Supply. Each dwelling allowed 10,000 gallons of water a month free of charge; sewage disposed of at a sewage farm, containing an incinerator; expense of operation and receipts. 400 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

Newton Sewerage Notes. Entire sewage of Newton, Mass., discharges into the outfall sewer of the Metropolitan Water and Sewerage Board. 400 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

Unique Features of Unified Operation of Water, Sewerage and Drainage Facilities at New Orleans, La. Many innovations and improvements over usual methods and procedure. 3 ills., 10,500 words. By Geo. G. Earl, gen. supt., Sewerage & Water Board, New Orleans. Municipal and County Engineering, April. 25 cts.

Day Labor on a Large Scale. Constructing 2-million dollar sewage treatment plant with municipal employes in Indianapolis. 100 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

WATER SUPPLY.

Pumping:

Cost of Pumping Through Pipe Lines. Table of cost per mile per million gallons of pumping water at various rates through different sizes of cast-iron pipe lines. By G. C. Habermeyer, state water survey division, Urbana, Ill. 1 table, 1,000 words. Fire and Water Engineering, Apr. 24. 15 cts.

The Wills Pumping System. Particularly adapted to water works of small cities and towns; first successfully installed in Memphis; forces water directly into mains from wells. 1 ill., 500 words. Fire and Water Engineering, Apr. 16. 15 cts.

Deep Well Pumps at El Paso. Water obtained from 44 wells averaging 600 feet deep except two of 900 feet; total production obtainable 10 million gallons a day; all operated by air-lift. 600 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Vergennes Pumping Station. Description of the Vermont city's power development; new power house and dam built, and new pumping outfit installed; old machinery held as a reserve unit; distribution system practically a closed one. By H. W. Taylor, engr., N. Y. C. 4 ills., 1,200 words. Fire and Water Engineering, Apr. 30. 15 cts.

The Hydraulic Ram. Its possibilities for small town installations apparently not appreciated by engineers; descriptions of some important installations. 2 ills., 2,000 words. Fire and Water Engineering, Apr. 16. 15 cts.

Design of New Electric-Drive Water-Pumping Station was Governed by Power Rate. Current charge for 3 months depends on maximum use in any 2-hour period; universal meter system postponed because temporarily cheaper to pump more water, but expected to come later. By Henry W. Taylor, consulting engineer, N. Y. C. 2 ills., 2,500 words. Engineering News-Record, Apr. 3. 20 cts.

Variable Power Sources Add to Dependability of Water Supply. Manchester consistently improves waterworks. By R. W. Fracker, engr., Waterworks, Manchester, N. H. 600 words. American City, April. 35 cts.

Waste Prevention:

Prevention of Water Waste and Reasons for Metering in Large Western City. Extracts from pamphlet supplied each customer by the Spring Valley Water Co. of San Francisco in introducing new system of charges. 1,400 words. Canadian Engineer, Apr. 24. 15 cts.

Devices for Water-Waste Surveys at Oak Park, Ill. Portable Venturi meter to test pipe districts; pitometer inserted in house service makes leakage charts. 3 ills., 1,100 words. Engineering News-Record, Apr. 24. 20 cts.

Baths, Pressure and Pipes Influence Effect of Water Meters. Three factors noted by H. P. Matte, chief sanitary engineer of Illinois State Department of Public Health in paper before Western Society of Engineers. 500 words. Engineering News-Record, Apr. 17. 20 cts.

Compound Meters. Not on the approved list in New York City, but advisability of their use in saving revenue on large installations has been considered. By Fred B. Nelson, dept. of water supply, gas and electricity, N. Y. C. 1,000 words. Canadian Engineer, Apr. 3. 15 cts.

Water Consumption Cut More Than Half at Newark, O. Contract for water-waste survey reduced underground leakage and located illegal use of water. By F. H. Waring, ass't engr., Ohio State Dept. of Health, Columbus, O. 1,500 words. Engineering News-Record, Apr. 10. 20 cts.

Prevention of Water Waste and Reasons for Metering. Extracts from pamphlet supplied each customer by the Spring Valley Water Co. of San Francisco, setting forth reasons for changing water rates and advantages of new system of charges. 1,200 words. Engineering and Contracting, Apr. 9. 15 cts.

Publicity in Water Waste Prevention Work. The news value of appeals in public press. 1 ill., 600 words. American City, April. 35 cts.

Office Methods:

Labor-Saving Method of Handling Water Consumers' Accounts. An ingenious system employed by the water department of Braddock, Pa.; "10-day final notice card." 2 ills., 400 words. Engineering and Contracting, Apr. 9. 15 cts.

Water Department Bookkeeping. A communication from the Punta Gorda department asking for information as to efficient method of handling water accounts is answered by Albert L. Sawyer, water registrar of Haverhill, Mass. 4 ills., 400 words. Fire and Water Engineering, Apr. 9. 15 cts.

Card Index of Valves. Engineering Department of Newton, Mass., maintained card index of water service pipes, showing measurements of gate valves, this method proving satisfactory, according to the city engineer. 300 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

Water Charges in 51 Cities of 9,000 to 10,000 Population. Interesting information collected by Mr. Kenyon Riddle, of Xenia, O. 1 table, 200 words. Engineering and Contracting, Apr. 9. 15 cts.

Purification:

Chloramine and Crenothrix. Experiments to determine stability of chloramine solutions of different strengths; series of determinations of rate of decomposition of solutions; crenothrix troubles can be eliminated. By W. F. Monfort and O. A. Barnes. 2,000 words. Fire and Water Engineering, Apr. 23. 15 cts.

Chloramine and Crenothrix. Data concerning decrease in available chlorine of a chloramine solution, and rate of decomposition of chloramine solutions; action of chloramine on crenothrix. Paper before Illinois section, American Waterworks Ass'n, by W. F. Montfort and O. A. Barnes. 2,000 words. Canadian Engineer, Apr. 10. 15 cts.

Chloramine. Data concerning decrease in available chlorine of a chloramine solution, and rate of decomposition of chloramine solutions of different strengths. From a paper before the meeting of American Waterworks Ass'n, by W. F. Montfort and O. A. Barnes. 1,400 words. Engineering and Contracting, Apr. 9. 15 cts.

Regulating Chlorine Doses. Adjusting size of dose to character and condition of water treated; conclusions from experiments by Maryland Health Department; color and turbidity impracticable; five-minute absorption test recommended. 1,700 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

High Rate of Filtration Feasible for Detroit Water-Supply. Experiments warrant recommendation for rate of 175,000,000 gallons per acre; estimates for 300,000,000-gallon plant. 600 words. Engineering News-Record, Apr. 3. 20 cts.

Water Softening. Investigation; features of plant; and special problems of large installations. Abstract of paper before meeting of Ill, section of American Waterworks Ass'n. By M. F. Stein, civ. engr., Chicago. 5 ills., 2,700 words. Engineering and Contracting, Apr. 9. 15 cts.

The Lime Softening of Water and the Use of Sludge as an Aid. Description of the Grand Rapids mixing tank and typical experience with the changing seasons, illustrating the relations of time and temperature. By W. A. Sperry, chemist, filtration plant, Grand Rapids, Mich. 2,500 words. Engineering and Contracting, Apr. 9. 15 cts.

Lime Softening of Water and the Use of Sludge as an Aid. Typical experience at Grand Rapids mixing tank with the changing seasons, illustrating relations of time and temperature. By W. A. Sperry, chemist, filtration plant, Grand Rapids, Mich. 4,000 words. Canadian Engineer, Apr. 17. 15 cts.

Algae Cause Taste in Fort Worth Water. Special treatment necessary; aeration basin being built. By Rob. H. Craig, captain, sanitary corps, U. S. A., Camp Bowie, Tex. 600 words. Engineering News-Record, Apr. 17. 20 cts.

Differentia of B. Coli. Brief consideration of the two sub-groups of the B-Coli group which are most important to the water bacteriologist, namely, B. Coli Communis and B. Lactis Aerogenes. Paper before the Illinois section of the American Waterworks Ass'n, by Everett Judson, ass't sanitary engr., U. S. Public Health Service. 1,100 words. Canadian Engineer, Apr. 3. 15 cts.

Dundas Has New Filter Plant on Gravity Supply. Expenditure of only $30,000 provides progressive Ontario manufacturing town with modern filtration plant of 700,000 imperial gallons daily capacity; concrete dam forms conservation reservoir and provides ample head for the 1½-mile pipe line to filtration plant. By E. H. Darling, consulting engr., Hamilton, Ont. 6 ills., 2,200 words. Canadian Engineer, Apr. 17. 15 cts.

The Necessity of Filtration. Why cities and towns should filter their water; economic consideration apparently most difficult of comprehension; heavy typhoid list. By F. B. Leopold, gen. mgr., Pittsburgh Filter Mfg. Co. 800 words. Canadian Engineer, Apr. 24. 15 cts.

Dry Feeding of Chemicals Used in Water Purification. Description of new machine developed by the Pittsburgh Filter Manufacturing Co., which has been in use in the Toledo filtration plant for over 2½ years; plants in Great Falls, Mont., Flint, Mich., and other cities employing system of dry feeding. By F. B. Leopold, vice-pres., Pittsburgh Filter Mfg. Co. 1 ill., 1,500 words. Municipal and County Engineering, April. 25 cts.

Dams:

New Brunswick's New Dam. Concrete arch dam recently constructed in an existing reservoir without drawing water from the same. 700 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Panels of Movable Weir Collapse Automatically. Tripping started by float in chamber filled as flood rises; double skimming eliminates sediment from canals. 5 ills., 1,700 words. Engineering News-Record, Apr. 24. 20 cts.

Blanket Lake Bottom to Stop Leaks from Water Reservoir. Dike also built to cut off bay from which loss was heaviest; gage observations show plan successful. 600 words. Engineering News-Record, Apr. 10. 20 cts.

Temperature Effects on Concrete Reservoir. Newton, Mass., built extension to covered reservoir to which water was not admitted until after winter of 1917-18, the cold weather of which subjected the exposed concrete to unanticipated temperature changes. 400 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

Move Equipment and Material for Dam Through Small Tunnel. In building dam everything had to go through 42x48-inch section of Santa Barbara water conduit then in service. 2 ills., 1,000 words. Engineering News-Record, Apr. 3. 20 cts.

Miscellaneous:

San Francisco's High-Pressure Water Supply. Recognized as one of the most powerful and efficient for fire protection ever constructed; safeguards with which system is protected from damage by earthquake or accident. 6 ills., 3,400 words. Engineering World, Apr. 15. 15 cts.

Water Supply at U. S. Government Camps and Cantonments. Accomplishments of the Construction Division of the War Department enumerated by Lieut.-Col. Dabney H. Maury, U.S.A., advisory engr. on water supply, at a meeting of local branch of Am. Society of Civil Engineers, New York. 1,600 words. Engineering World, Apr. 15.

New Soft Water Supply for Greater Winnipeg is put into service. General chorus of approval for new supply which contains only about 40 parts of hardness per million as compared to 500 parts contained in the previous artesian supply; brings water 95 miles. By W. G. Chace, chief engr., Greater Winnipeg Water Dist. 2 ills., 1,200 words. Canadian Engineer, Apr. 24; 15 cts.

Methods of Drilling and Test Results of Large Capacity Well. Interesting information regarding one of six wells that furnish the water supply of the University of Illinois. Abstract of paper before meeting of Ill. section of American Waterworks Ass'n, by M. L. Enger, Prof. of Mechanics and Hydraulics, University of Illinois. 3 ills., 1,200 words. Engineering and Contracting, Apr. 9. 15 cts.

Air-Lift Artesian Well. Supply of water for Clinton, Ia., is secured from some half dozen wells having a surface flow of limited volume; handled by means of air-lift pump. By John Oliphant, chief engr. of pneumatic pumping department, Sullivan Machinery Co., 1 ill., 500 words. Municipal Journal and Public Works, Apr. 5. 10 cts. Engineering and Contracting, Apr. 9. 15 cts.

Action of Certain Waters on Metals. The properties of certain western waters with reference to their effect on water and steam pipes; Champaign-Urbana water supply first of its kind to come under notice. By S. W. Parr, prof. applied chemistry, University of Illinois, Urbana. 1,000 words. Fire and Water Engineering, Apr. 2. 15 cts.

Causes and Prevention of Corrosion of Pipe Carrying Hot Water. By a process of "deactivation" even water which has considerable acidity may be rendered nearly non-corrosive. 400 words. Electric Railway Journal, Apr. 19. 15 cts.

Municipal Work in Detroit. Successful work in trench digging and pipe laying by the water department of the city; performs economically its own work in maintenance, repair and new construction; made possible by use of labor-saving machinery. 3 ills., 1,300 words. Fire and Water Engineering, Apr. 30. 15 cts.

The Freezing of a Reservoir Outlet Works. Two means of prevention suggested: Reducing rate of flow by drawing from each reservoir separately, or early formation of sheet of surface ice over water in the immediate vicinity of shaft. By Gilbert Christie, engr. and mgr., Irvine and District water board, from Transaction of Institution of Water Engrs. 1 ill., 1,100 words. Engineering and Contracting, Apr. 30. 15 cts.

Rainfall Records. Variation in rainfall rates of different areas; mass diagrams; evaporation and run-off. From paper before meeting of New England Waterworks Ass'n, by L. M. Hastings, city engr., Cambridge, Mass. 2,000 words. Canadian Engineer, Apr. 3. 15 cts.

American Waterworks Association. Officers nominated for coming association year; convention at Buffalo, N. Y., June 1 to 13, 1919; advance program and rules for exhibits. 6 ills., 1,500 words. Fire and Water Engineering, Apr. 9. 15 cts.

LIGHTING AND POWER.

Street Lighting:

Street Lights in Columbus. During 1918 the municipal electric light plant of Columbus, O., replaced the old-style carbon arc lamps on street lighting circuits by 400 c. p. gas-filled lamps; Lewis Rowe, acting superintendent, reports saving of one-half in current and labor, with 25% more light. 600 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

Simple Lamp-Record System for Street Lighting Circuits. Card records are easily maintained to show type and history of lamps in use on large systems for street, boulevard or park lighting operated on definite schedules. By T. D. McDowell, electrical foreman, South Park System, Chicago. 3 ill., 1,000 words. Electrical Review, Apr. 26. 30 cts.

Hydro-Electric Plants:

Water Economy in Hydroelectric Plants. Intelligent conservation of excess water may save coal in the operation of combined hydroelectric and steam plants; in some cases the power factor of the hydro-generator may be raised in order to utilize available water. By L. W. Wyss, Peninsular Power Co., Iron Mountain, Mich. 1 ill., 2,000 words. Electrical World, Apr. 12. 15 cts.

The 10,000 H. P. Hydro Electric Plant at Bombay. As rain falls only during 3 or 4 months, it was necessary to store water sufficient to give 100,000 h. p. for 10 or 12 hours a day during 9 months of year; lakes formed by 4 masonry dams. By Rob. B. Joyner, from paper before Institution of C. E. 800 words. Engineering and Contracting, Apr. 30. 15 cts.

Installation, Care and Maintenance of Water Wheels. Proof of water wheels is its operation; must have straight shaft. By D. W. Rounds, S. Morgan Smith Co., York, Pa. 1,000 words. Canadian Engineer, Apr. 24. 15 cts.

Construction Methods Used at Drummondsville. In damming the St. Francis river and building power house to develop about 19,000 h. p.; 2,900 feet of cofferdams required for 1,890-foot dam; concrete distributed over long distances in V-shaped, steel cars during winter. By James Dick, 7 ills., 2,800 words. Canadian Engineer, Apr. 24. 15 cts.

Interconnection Reduces Steam Reserve Necessary. Benefits which have been realized by tying together power systems in Central California; improvement of diversity factor and pooling of water power resources have proved of great advantage. By L. J. Moore, electrical engr., San Joaquin Light and Power Corporation. 4 ills., 2,000 words. Electrical World, Apr. 26. 15 cts.

Steam Plants:

Methods for Reducing Coal Consumption; 20 "Dont's" for Firemen and Water Tenders. Useful suggestions on conservation of coal based on experiences at the power plants of the Union Traction Co. of Indiana, given by G. H. Kelsey, electrical engr. of the company, in "Safety," the company's magazine. 1,600 words. Engineering and Contracting, Apr. 9. 15 cts.

Chemical and Physical Control of Boiler Operation. Abstract of A.S.M.E. paper; included is the application of simple formulas for estimating heat loss items, etc. By E. A. Uehling, pres., Uehling Instrument Co. 1 ill., 7,000 words. Electrical Review, Apr. 19. 30 cts.

Education of Boiler Room Men Necessary for Fuel Conservation. Experiences of several large companies in fuel conservation at their plants summarized by Edgar A. Hunger in Electrical World. 2,000 words. Engineering and Contracting, Apr. 9. 15 cts.

An Effective Yet Simple Bonus System for Power Plants. Result of a bonus system employed by the management of the Manila electric railway and devised by the writer, B. H. Blaisdell, chief engr. of the company's power plant, that has given most satisfactory results. 1 ill., 2,500 words. Engineering and Contracting, Apr. 9. 15 cts.

Scraping of Boiler Tubes in the Boiler Setting. A casting with openings in front or rear wall of a boiler setting gives access for scraping off cinder deposit from tubes. 1 ill., 500 words. Electric Railway Journal, Apr. 19. 15 cts.

Miscellaneous:

Constructs Largest Gas Line in the United States. Coke plant builds gas main 40 inches in diameter laid near Pittsburgh; method of construction and joints described. 5 ills., 1,400 words. Engineering News-Record, Apr. 10. 20 cts.

Economic Use of Static Condensers. Problems of power-factor correction by static condensers are analyzed for purposes of improving voltage regulation and reducing copper losses; when and to what extent it pays to install condensers. By Waldo V. Lyon, ass't professor of electrical engrg., Mass. Institute of Technology. 4 ills., 3,500 words. Electrical World, Apr. 12. 15 cts.

Economic Use of Static Condensers. Solution of problem of increasing capacity of a generating plant by using static condensers to correct power factor; determination of feasibility of putting less generating equipment in new plant by using condensers. By Waldo V. Lyon, ass't professor of electrical engrg., Mass. Institute of Technology. 2 ills., 2,300 words. Electrical World, Apr. 19. 15 cts.

Effect of Prohibition on Lighting Revenue. Analysis of experience of companies in communities already dry indicate what may be expected to happen after July 1 in those places where liquor is now sold. 2 tables, 2,500 words. Electrical World, Apr. 12. 15 cts.

Lubrication of Electric Generators and Motors. Importance of lubrication; influence of type of apparatus upon choice of lubricant; characteristics of different lubricants; choice of lubricant for specific purposes. By Reginald Trautschold, Swan & Finch Co. 2,000 words. Electrical Review, Apr. 19. 30 cts.

Bureau of Standards Studies Return Circuit Conditions in Milwaukee. Report recently completed is the first prepared at the request of a public service commission. By E. R. Shepard, electrical engr., Bureau of Standards. 4 ills., 2,500 words. Electric Railway Journal, Apr. 19. 15 cts.

The Electrical Installation in San Francisco's City Hall. Extensive conduit and wiring system for light, power, communication and signaling; some of the special features. 7 ills., 7,000 words. Electrical Review, Apr. 26. 30 cts.

Combined Central-Station Report for United States. Census Bureau's summary of state reports shows decided increases in industry throughout country. 700 words. Electrical Review, Apr. 5. 30 cts.

STREET CLEANING AND REFUSE DISPOSAL.

Refuse Collection:

Planning Refuse Collection. Editorial comment on article in this issue with general suggestions for planning system of refuse collection. 300 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Scavenging Unsewered Districts. Editorial discussion of sanitary pail system, with strictly regulated collection and disposal, for small communities which are unsewered. 150 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Efficiency in City Scavenging. Introducing more effective and economical methods into the removal of night soil in a southern city; general suggestions for planning a system of refuse collection. 3 ills., 2,800 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Refuse Disposal:

Dumping Refuse at Oakland. City continuing this method, having covered over five acres, which has settled to such an extent that it is not more than three or four feet above high water. 300 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

The Army's Utilization of Camp Wastes. Change of army practice from incineration to utilization not detrimental to health and netted Government $2,-

000,000 a year; first utilization contracts; present contracts reduce waste of food. By F. C. Bamman, consulting engr., Washington, D. C. 2 ills., 4,500 words. Municipal Journal and Public Works, Apr. 26. 10 cts. (To be concluded.)

Construction and Operation of the New Refuse Destructor in Brookline, Mass. Must be maintained to the satisfaction of Board of Health; house holder required to separate refuse into three classes. 3 ills. By H. A. Varney, town engr. 3 ills., 900 words. American City, April. 35 cts.

Refuse Disposal in London. How St. Marylebone screened its refuse, recovered paper and other salable materials, and used a clay pit for dumping. 1,500 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

Street Cleaning:

Efficient Methods of Snow Removal from Highways Outside of Urban Districts. Conditions to be considered are the geographical location of section and local conditions. Committee report before the American Road Builders' Ass'n. 1,700 words. Good Roads, Apr. 26. 10 cts.

Notices Painted on Sidewalk. Mayor King, of Bristol, Tenn., has adopted novel method for calling public's attention to ordinances for keeping streets clean. 100 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

FIRE DEPARTMENT.

A Fire Station Staged. Novel scene by the fire department of Portland, Ore., in a safety bureau exhibition; complete fire house, with apparatus, equipment and firemen; other interesting features shown in fire prevention exhibit. By Fred R. Waters. 500 words. Fire and Water Engineering, Apr. 9. 15 cts.

Fire Escapes. Ideal conditions and actual very different; not always possible to alter old buildings to accommodate new ideas. By Marshall H. W. Bringhurst, Seattle, Wash. 2,400 words. Fire and Water Engineering, Apr. 23. 15 cts.

New York and Two Platoons. A consideration of the relative advantages of the single and double platoon systems from the standpoint of the big city's best service; advantage of a contented personnel under two-platoon emphasized. By C. E. Meek, N. Y. C., asso. mem. I. A. F. E. 1,000 words. Fire and Water Engineering, Apr. 30. 15 cts.

Pyromania. An insane disposition to incendiarism; disease prevails to an alarming extent; some remarkable case cited; a remedy in education of the young in schools. By Ole O. Foe, state marshal of Iowa, from paper before joint meeting of State Fire Marshals' Ass'n and Nat. Board of Fire Underwriters, N. Y. C. 2,200 words. Fire and Water Engineering, Apr. 9. 15 cts.

TRAFFIC AND TRANSPORTATION.

Long-Distance Motor-Truck Haulage Costs in Ohio. Routes between Akron, Youngstown and Cleveland investigated; present rates too low; operate for 52 cents per truck mile. 1,200 words. Engineering News-Record, Apr. 10. 20 cts.

Motor Truck Haulage for Farmers. Suggestions based on the operations of a Farmers' Co-operative Company in Hartford county, Maryland. 1 ill., 1,200 words. Good Roads, Apr. 12. 10 cts.

The New York and New Jersey Vehicular Tunnel. Reasons for constructing it and merits of various types of tunnel proposed. 6 ills., 3,300 words. By Edward A. Byrne, chief engr., Dept. of Plants and Structures, N. Y. C. Engineering World, Apr. 15. 15 cts.

What Shall We Do with the Street Railways? Service at cost a step toward public operation; public regulation as difficult as public operation; capital value the primary problem. By Delos F. Wilcox. 2,400 words. American City, April. 35 cts.

STRUCTURES AND MATERIALS.

Cement and Concrete:

Solubility of Portland Cement. And its relation to theories of hydration. By J. C. Witt and F. D. Reyes, of the Laboratory of General, Inorganic and Physical Chemistry, Bureau of Science, Manila, P. I. 3,400 words. Engineering World, Apr. 1. 15 cts.

Has the Los Angeles Municipal Cement Plant Been an Economic Success? Ten years ago a plant costing $890,000 was put into operation and is now to be sold, $450,000 being the minimum bid considered. 1,000 words. Engineering and Contracting, Apr. 2. 15 cts.

Depositing Concrete Under Water. Data which the Masonry Committee of the American Railway Engineering Association believes it is desirable to present as representing the best practices to be followed. 2,400 words. Engineering World, Apr. 1. 15 cts.

How to Design Concrete Mixtures. Proper proportions can be determined for different kinds of material; new theories regarding aggregate grading advanced by D. A. Abrams as result of tests. 7 ills., 4,500 words. Engineering News-Record, Apr. 17. 20 cts.

Bridges.

Highway Bridges and Heavy Trucks. Necessity of frequent inspection by competent men; how weak bridges can be strengthened. Report to the American Road Builders' Ass'n by its committee, of which Willis Whited is chairman. 2,400 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

Are Our Highway Bridges Safe? County highway officials say one-third of all bridges are unsafe for heavy trucks; a state authority says 80%; defective bridges more serious than defective roadways. 9 ills., 2,500 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

But How About the Bridges? Editorial comment on the inconsistency of limiting trucks to maximum weights which many of the bridges cannot carry with safety. 150 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

British Joint Committee Report on Loads on Highway Bridges. Classification of the bridges reduced to three classes; effect of speed; tires and wheel diameters. From The Surveyor, Mar. 7. 1,000 words. Engineering and Contracting, Apr. 30. 15 cts.

Standard Bridge Abutments on Canal Projects. Two types of abutments, reinforced concrete and timber pile, are used on Rio Grande irrigation development. By D. C. Willett, El Paso, Tex. 2 ills., 300 words. Engineering News-Record, Apr. 17. 20 cts.

Timber Arch Bridge One Hundred Feet in Length. Forces of Fulton Coal Co. design and build structure; Luten formula for a concrete arch ring used. By D. R. Walkinshaw, Greensburg, Pa. 2 ills., 400 words. Engineering News-Record, Apr. 17. 20 cts.

New Type of Expansion Joint Devised for Concrete Girders. Consists of trough-shaped steel plate sliding on bedplate. 1 ill., 300 words. Engineering News-Record, Apr. 17. 20 cts.

Highway Bridge Piles Concreted to Avoid Replacing. Work accomplished without interruption of traffic when piles had been practically destroyed by teredos. By F. E. Semon, city engr., Port Angeles, Wash. 2 ills., 700 words. Engineering News-Record, Apr. 17. 20 cts.

Canada's Longest Reinforced Concrete Trusses. The 2 bridges that carry the Toronto-Hamilton highway across the Etobicoke river and Bronte creek; each 119 ft. 1½ in. clear span, with 20 ft. roadway and 16 ft. overhead clearance; arches rise 26 ft. above floor level. 15 ills., 2,000 words. Canadian Engineer, Apr. 3. 15 cts.

Maintenance and Painting of Highway Bridges. Classification of structures according to conditions; strengthening and repairing old bridges; bridge floors. Abstracted from address before the Road School, University of Kentucky, by Chas. D. Snead, bridge engr., state dept. of public roads, Ky. 1,300 words. Canadian Engineer, Apr. 3. 15 cts.

New Bridge Across Lake Boundary of Worcester, Mass. Consists of six arches and a viaduct, and is constructed of reinforced concrete. By Philip H. Holbrook. 1 ill., 500 words. American City, April. 35 cts.

Progress Report of the Committee on Methods of Strengthening and Reconstructing Highway Bridges for Heavy Truck Traffic. Presented at the convention of the American Road Builders' Ass'n. 2,500 words. Good Roads, Apr. 5. 10 cts.

Reinforced Concrete Lift-Span Towers for High Bridge. Economic studies for bridge over the Osage river in Missouri showed that reinforced concrete towers were cheaper and more desirable than structural steel. By F. H. Frankland, consulting engr., N. Y. C. 1 ill., 700 words. Engineering News-Record, Apr. 3. 20 cts.

Miscellaneous:

Relieving Arches in Subway Distribute Stress to Piers. Engineer's special design meets difficult loading conditions imposed by architect's design; groined arches used in street subway under a park. 5 ills., 1,700 words. Engineering News-Record, Apr. 3. 20 cts.

Sewer Complicates Foundation Plans. Armory building has concrete columns seated on girders spanning sewer; basement floor is carried by girders. 2 ills., 500 words. Engineering News-Record, Apr. 17. 20 cts.

Notes on the Design of a Single-Wall Cofferdam. Size and location of timber walls and braces and size of timber and steel sheeting developed from both theoretic and economic considerations. By F. R. Sweeny, engr., Foundation Co., Pittsburgh, Pa. 3 ills., 2,500 words. Engineering News-Record, Apr. 10. 20 cts.

New Municipal Pier in Philadelphia. Progressive construction advances city's standing as a seaport. 500 words. American City, April. 35 cts.

Concrete Pile Trestle Construction. Economy lies in the fact that the piles and slabs can be cast in a central yard where supplies of sand and gravel are easily obtained; pile trestles cost only about 80% as much as earlier type with solid piers. By Albert M. Wolf. 6 ills., 1,700 words. Engineering World, Apr. 15. 15 cts.

The Francois and Portier Grouting Processes. Injection should be done under considerable pressure; condition most suitable for hard setting in the shortest time, when the cement is pumped under pressure into fissures. By A. H. Krynauw, from Transactions Chemical, Metallurgical and Mining Society. 1,100 words. Engineering and Contracting, Apr. 30. 15 cts.

Solving Construction Problems in Canal Street Subway. High ground-water level complicated deep construction work under old subway in New York City; pit and drift methods used. By A. J. Mayell, ass't division engr., Public Service Comn., N. Y. C. 4 ills., 2,300 words. Engineering News-Record, Apr. 3. 20 cts.

Philadelphia City Hall Subway Station. Construction of the new subway under the Philadelphia city hall is interesting to engineers and contractors on account of its numerous features; work was of so much importance that it was not halted during the war. By Harry Gardner. 12 ills., 4,000 words. Engineering World, Apr. 1. 15 cts.

Record Height Concrete Multiple-Arch Dam Completed. Dam forming Lake Hodges in irrigation district near San Diego is 136 feet from crest to low point in valley. 4 ills., 900 words. Engineering News-Record, Apr. 10. 20 cts.

MISCELLANEOUS.

Town Planning Includes "Sunlight Engineering." Streets should generally run northeast-southwest or northwest-southeast instead of being square with the cardinal points; main streets built up with skyscrapers should be north-south if building heights cannot be limited. By H. L. Seymour, engrg. ass't to the Domion housing and town planning adviser. 2 ills., 4,500 words. Canadian Engineer, Apr. 10. 15 cts.

The Chicago Railway Terminals. The cooperative principle; application of a solution of the terminal problem; river straightening; passenger stations. By E. J. Noonan, chief engr., Chicago Ry. Terminal Commission. 4 ills., 5,500 words. Engineering World, Apr. 1. 15 cts.

An Interallied Architectural Competition: A Model City to Be Built. City of Chauny on the Aisne has opened an interallied competition for improving arrangement and extension of city and its suburbs under most modern conditions. By Preston Hersey. 600 words. American City, April. 35 cts.

Housing Schemes. Methods already worked out; how they would affect Canada; New Zealand methods. By J. W. MacMillan. 1,500 words. Canadian Municipal Journal, April. 20 cts.

The U. S. Homes Registration Service as a Civic Asset. Present need of homes; good housing a community affair. By Edward L. Schaub, chief, section of Homes Restoration Service, U. S. Housing Corporation. 1,800 words. American City, April. 35 cts.

The Canadian Government Housing Loan. The four conditions attached to the federal loan. By Thos. Adams, town

(Continued on page 348)

NEWS OF THE SOCIETIES

May 12-14.—AMERICAN ASSOCIATION OF ENGINEERS. Annual meeting, Chicago, Ill. Secretary, C. E. Drayer, 29 South LaSalle St., Chicago, Ill.

May 14-15.—LEAGUE OF TEXAS MUNICIPALITIES. Seventh annual convention, Sweetwater, Tex. Secretary-treasurer, Frank M. Stewart, University of Texas, Austin, Tex.

May 19-24.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Atlantic City, N. J. Secretary, T. C. Martin, 29 W. 39th St., New York.

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

June 17-20.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, St. Paul-Minneapolis. Secretary, Charles W. Hunt, 33 W. 39th St., New York, N. Y.

June 23-26. — SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, Coates House, Kansas City, Mo. Secretary, E. L. Fulkerson, 617 Washington St., Waco, Tex.

June 24-27. — AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University of Pennsylvania.

June 24-27.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Springfield, Ill.

National Highway Traffic Association.

The annual meeting of the National Highway Traffic Association will be held at the Automobile Club of America, 247 West 54th street, New York City, on Wednesday, May 14, 1919.

The afternoon session will be devoted to a joint conference of the Reconstruction Commission of the State of New York and the association. The following addresses will be made:

"Development of Rural Motor Express Throughout the United States," by F. W. Fenn, secretary, Motor Truck Committee, National Automobile Chamber of Commerce.

"Transportation Surveys for Rural Motor Express Routes," by J. H. Collins, member, Highways Transport Committee, Council of National Defense, and investigator of market surveys, United States Department of Agriculture.

"Wanted: Rural Motor Express in the State of New York," by James E. Boyle, extension professor of rural economy, Cornell University.

"Sign Posting for Through Routes in Municipalities and Detours During Highway Construction," by Elmer Thompson, secretary of the Automobile Club of America.

At the business session will be received the annual reports of the secretary, Elmer Thompson, and treasurer, George H. Pride, and of the executive committee, by Elmer Thompson. The committee on "Pavement Openings and Restorations," B. H. Wait, chairman, W. G. Chollar, and J. B. Vandever, will report. The nominating committee will submit its report and the election of officers for 1919-1920 will be held.

An informal dinner, at $1.50 per cover, will be served in the grill room of the club at 6.30 p. m.

The evening session, at 8 p. m., will open with the presidential address, "Highway Transport Engineering" (illustrated), by Arthur H. Blanchard. Then will follow:

"The Townsend Highway Bill and the Work of the Federal Highway Council," by H. G. Shirley, secretary, Federal Highway Council.

"Highway Requirements for Twentieth Century Transportation," by W. G. Thompson, state highway engineer of New Jersey.

"The Control of Traffic on Feeder Highways," by Edward J. Mehren, editor, Engineering News-Record; George H. Pride, president, Heavy Haulage Company; and George M. Graham, manager, Pierce-Arrow Motor Car Company.

"The Open Road to a Greater America," by the Educational Department of the Universal Film Manufacturing Company—first production of a motion picture created to show the high cost of bad roads and the advantages of motor transport.

The public, including ladies, is cordially invited to attend the dinner and the several sessions. The secretary, Elmer Thompson, 247 West 54th street, New York City.

The American Association of Engineers.

The American Association of Engineers received 123 applications for membership in one day, April 18. Secretary C. E. Drayer of the Association wishes to know if this is not the best day's record of any national society of engineers.

The secretary announces that the proceedings of the Chicago Conference of March 17, and the hearing at Washington, March 31, are now ready for distribution and that a copy will be sent to any engineer who makes request of the association headquarters, 29 S. LaSalle St., Chicago.

The staff at national headquarters had been strengthened by the addition of Mr. D. A. Tomlinson as assistant secretary. He has charge of the railroad work and will aid in the service department of the association by reason of experience gained while central zone manager of the Special and Professional Section of the U. S. Employment Service. Mr. Tomlinson was formerly with the Western Society of Engineers several years ago.

The Chicago Chapter of the association has selected as manager L. J. Burke. Mr. Burke has been engaged in railroad work and has recently received his discharge from the Army, in which he was a Captain.

The following were recently elected officers of the Cincinnati Chapter of the association: President, E. K. Ruth, asst. professor, dept. of civil engineering, University of Cincinnati; vice-president, G. E. Halstead, 2147 St. James ave., Walnut Hills; secretary, L. P. Kimball, Engineer of Bldgs., B. & O. R. R., Cincinnati; treasurer, C. S. Carrol, college of civil engineering, University of Cincinnati.

At Portland, Ore., a chapter of the association is in process of formation. Officers are: President, W. H. Marsh, prin. asst. engr., Spokane & Seattle Ry. Co.; secretary-treasurer, R. W. Barnes, prin. asst. engr. Southern Pacific Co.

Alabama Municipal League.

An organizing convention of mayors and other city officials of Alabama was recently held at the Tutwiler hotel, Birmingham. A number of important municipal subjects, especially the financing of public improvements were considered.

George E. Crawford, mayor of Mobile, was elected to head the league. Other officers were mayor Jones of Bessemer, five vice-president; C. A. Whitmeyer, of Jacksonville, second vice-president; L. Bemish, of Selma, third vice-president; H. S. Ryall, of Birmingham, secretary-treasurer. An executive committee was named consisting of W. E. Stripling, of Florence; Dr. N. A. Barnett, of the city commission of Birmingham; W. C. Glenn, of Enterprise; D. P. Coleman, of Uniontown, and H. S. Chase, of Huntsville.

The league adopted a constitution and by-laws and adjourned to meet next in Montgomery on May 28.

American Institute of Electrical Engineers.

The annual business meeting of the American Institute of Electrical Engineers will be held Friday, May 16, 8:30 p. m., in the auditorium of the Engineering Societies building, New York. At this meeting, the board of directors will report and the new officers elected announced.

The Weaver memorial tablet, which is to be erected in the headquarters of the institute "in acknowledgment of the services rendered to the institute and to the electrical engineering profession by William D. Weaver," will be exhibited.

The Edison medal will then be formally presented to Benjamin G. Lamme for his inventions and services in the development of electrical machinery. Mr. Lamme holds about 140 patents, many of fundamental importance in the present methods of generating, transmitting and using electrical power. Since 1889 he has been connected with the Westinghouse Electric and Manufacturing Co. He is widely known among electrical en-

gineers, both in Europe and America. In 1915, upon nomination by the institute, he was appointed a member of the Naval Consulting Board.

INDUSTRIAL NEWS

Blasting Concrete With Explosives.

E. I. du Pont de Nemours & Co., Wilmington, Del., has issued a pamphlet entitled "Blasting Concrete With Du Pont Explosives," by S. R. Russell, C. E. It should prove useful to contractors and public works officials who are confronted with the problem of quickly and economically removing old concrete, such as machinery foundations, old walls, old bridge abutments or piers. Practical directions are given, with helpful details.

The American-La France Fire Engine Co., Inc., Elmira, N. Y., announces the shipment of the following equipment: Watertown, N. Y., type 12 combination; New York, N. Y., gasoline propelled motor cars (3); Atlantic City, N. J., type 31 tractor; New York, N. Y., gasoline propelled motor cars (2), Arlington, N. J., type 12 triple combination pumping engine, chemical engine hose car; Jersey City, N. J., type 12 triple combination (2); Yokohama, Japan, two type 40 pump and hose cars; West Chester, Pa., type 12 combination; Port Huron, Mich., type 12 combination; Hudson, N. Y., type 14 service truck; Idaho Falls, Idaho, type 17 tractor; Mitchell, S. Dak., type 12 triple; Osage, Iowa, type 40 combination with Jr. pump; Eau Claire, Wis., type 12 triple; Littlestown, Pa., type 40 combination with Junior pump; Tacoma, Wash., two type 12 triples, two pumping engines and hose cars.

The Philadelphia Vitrified Brick Co., Philadelphia, Pa., has engaged in the manufacture of wire-cut lug paving brick under license contract with The Dunn Wire-Cut Lug Brick Co., of Conneaut, O. The eastern works of the company are at Saxton, Pa. Charles D. Ames is president of the company and J. T. Hawthorne is secretary and treasurer. The addition of the plant of the Philadelphia Vitrified Brick Co. makes 75 plants licensed to make wire-cut lug brick in twelve states.

Equipment Layout on Road Work.

A useful collection of "blue prints" has been issued by the **Koehring Machine Co.,** Milwaukee, Wis., which should prove helpful to highway construction officials and contractors on concrete highway work. The title is "Blue Print Suggestions on Haulage, Loading Stations and Mixer Equipment for Road Work." With the possibilities of bigger construction units, the problems of hauling, loading and mixing become important and this booklet presents suggestions upon which efficient methods can be based. Various types of problems are studied and diagrams presented showing solutions which should prove effective. Those who have concrete roads to build this season should get a copy of these blueprints.

MUNICIPAL INDEX

planning advisor, Canadian Comn. of Conservation. 800 words. American City, April. 35 cts.

Community Heating of Dwellings. Economy, cleanliness and convenience of central station heating as compared with house furnaces; heating as the prime object and electric current as the by-product. 4,500 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

Columbus Board of Purchase. Considerable sums saved by knowledge of all department needs and of market fluctuations, personal bargaining, and standardization of supplies. 900 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Oakland Municipal Garage and Shop. 53 cars regularly maintained and others repaired occasionally; maximum economy and efficiency aimed at; purchasing and handling materials; records of materials, operations and performances; new equipment constructed. By C. W. Geiger. 3 ills., 3,300 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

Municipal Photograph and Blue Print Plant. Operated by San Francisco for doing all the work required by all departments of city government; electric blue print machine; photostat machine. 2 ills., 300 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

A Uniform System of Accounting for Cities of the Third Class in New York. Under immediate charge of a bureau the operations of which are not directly related to the affairs of the state, but rather to those of its political subdivisions. By Eugene M. Travis, state comptroller, Albany, N. Y. 1,000 words. American City, April. 35 cts.

Free Public Utilities. Indication that trial may be made before long in this country of public utilities of various kinds operated at expense of taxpayers for free use of all citizens. 400 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

How Should a Federal Department of Public Works Be Organized? Need for clear determination of what bureaus should be included, and how personnel should be protected and built up. By Chas. W. Baker, consulting engr. 2,800 words. Engineering News-Record, Apr. 10. 20 cts.

The Port of Seattle. Has more mechanical handling equipment than any other port in the U. S. with exception of New Orleans. 3 ills., 2,500 words. By G. F. Nicholson, chief engr. Engineering World, Apr. 15. 15 cts.

Field Methods on Rapid Stadia Surveys at Columbus. All lines by stadia, levels taken with transit; special rod extension; colored cloths and whistles for signals. By H. K. Kistler, instructor in civil engrg., Pennsylvania State College. 2 ills., 600 words. Engineering News-Record, Apr. 17. 20 cts.

How Educational Reconstruction Should Develop. Modern American engineering education must become more effectively concrete in application of theory to practice. By L. W. W. Morrow, ass't professor of electrical engrg., Sheffield Scientific School, Yale University. 3,500 words. Engineering News-Record, Apr. 24. 20 cts.

Education and Training of Municipal and County Engineers. Giving opinions of various engineers at a discussion at special meeting of Institution of Municipal and County Engrs., from The Surveyor. 2,000 words. Engineering and Contracting, Apr. 30. 15 cts.

Lessons from Professional Organization in England. Editorial discussion referring to abstract in this issue of the report by Sidney and Beatrice Webb; conditions bear striking similarity to those in this country. 1,500 words. Engineering News-Record, Apr. 10. 20 cts.

Obtaining Proper Recognition of the Engineering Profession. Three prime requisites are organization, licensing and broader education, interest and activity in other than purely technical matters. Excerpts from address by W. W. K. Sparrow, chief engr., Chicago, Milwaukee & St. Paul Railroad Co., Chicago. 2,200 words. Municipal and County Engineering, April. 25 cts.

Professional Organization in England. Abstract of an analysis by Sidney and Beatrice Webb of the motives, methods and results of such organization, including that of engineers. 6,000 words. Engineering News-Record, Apr. 10. 20 cts.

Prices Yesterday, Today and Tomorrow. An analysis of the factors; scarcity, demand, advance in wages and inflation; responsible for the present high price level. Paper by O. P. Austin, statistician of the Nat. City Bank, N. Y. C., before Editorial Conference of N. Y. Business Publishers' Ass'n. 4,000 words. Engineering News-Record, Apr. 24. 20 cts.

High Price Level a Future Probability. Discussion on the new price revolution, which was read before the conference of governors and mayors at Washington by Irving Fisher, professor of political economy of Yale University. 1 ill., 3,100 words. Gas Age, Apr. 1. 25 cts.

An Analysis of Present Market Conditions. Reconstruction, costs of materials, supply and demand; examples of activity; greatly reduced costs improbable. From a paper before conference of American Gas Ass'n by Edmund S. Dickey, Baltimore, Md. 5,600 words. Gas Age, Apr. 1. 25 cts.

How Shall the Labor of the Country Be Restored to a Normal Basis? Ideas presented at the recent conference of governors and mayors at the White House. Bringing Unused Land Into Service, by Hon. Franklin K. Lane, Secy. of the Interior. Deportation of Aliens, by Hon. W. B. Wilson, Secy. of Labor. Means of Restoring Industrial Activity, by Hon. James M. Cox, Governor of Ohio. "Buy Wisely but Buy Now," by R. W. Babson, Dept. of Labor. A Home-Building Campaign Essential, by Ernest T. Trigg. "We Stand in Need of Good Roads," by S. M. Williams, pres., Highways Industries Ass'n. 1 ill., 3,600 words. American City, April. 35 cts.

City and County Engineers Report Public Works Activity in All Parts of the Country. Letters from city and county engineers reflect optimism of local authorities and report specific plans and progress. 4,200 words. Municipal and County Engineering, April. 25 cts.

Public Works Booming. Best contractors will soon be loaded up with work; those wishing to let work to such or to obtain efficient foremen or mechanics will need to act promptly. 250 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

The Sioux Falls Spillway for Flood Relief of the Big Sioux River, South Dakota. The original spillway; new spillway designed to absorb energy of water; method of making hydraulic excavation; protecting concrete against erosion. By F. C. Shenehon, Mem. Am. Soc. C. E., 628 Metropolitan Bank Bldg., Minneapolis, Minn. 6 ills., 2,500 words. Municipal and County Engineering, April. 25 cts.

Flood Control Work in Washington. Description of what has been accomplished in the Inter-county River Improvement project, undertaken about 5 years ago. By W. A. Scott. 12 ills., 4,800 words. Engineering World, Apr. 1. 15 cts.

New Methods for the Solution of Backwater Problems. Use of diagrams with only one major variable reduces computations and leads to more accurate results. By H. R. Leach, Saginaw, Mich. 6 ills., 2,300 words. Engineering News-Record, Apr. 17. 20 cts.

Cost of Ditches for Reclaiming Idaho Lands. Cultivated ground spoiled by excess irrigation water is restored by drainage; caterpillar electrically-driven excavators used. By D. W. Cole, formerly project mgr., Boise Irrigation Project, U. S. Reclamation Service, Boise, Idaho. 1,000 words. Engineering News-Record, Apr. 3. 20 cts.

Inclined Railway to Deliver Materials on Hetch Hetchy Project. 1,700-foot incline to early intake portal. 1 ill., 400 words. Engineering News-Record, Apr. 10. 20 cts.

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI NEW YORK, MAY 17, 1919 No. 20

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 8, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9691
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Editorial Notes 349
Pavement Guarantees—Mechanical Agitation for Activated Sludge—Mosquito Extermination as an Investment.

Improving Providence Water Supply (Illustrated)..... 350
A temporary dam and a regulating dam with spillway of horse-shoe shape are described by **John Rositer Hess, Jr.**

Cost of Concrete Bridges..... 353

A High-Cost Highway..... 353

Parking Automobiles Ruins Asphalt..... 353

A Problem in Anopheles Elimination (Illustrated)..... 353
How shallow water around a pond was prevented by building cofferdams and drains.

Hog Feeding in Spokane..... 354

Pavement Guarantees 355
General practice of county highway departments and opinions of county highway officials.

Activated Sludge Without Compressed Air..... 356
Experiments made in Sheffield, England, during the past three years indicate the possibility of substituting mechanical stirring for the use of compressed air.

Lime for Illinois Concrete Roads..... 356

Texas Highways under Construction..... 356

News of the Societies..... 357

Problems Cities Are Studying with Experts..... 357

Industrial News 358

Personals 359

Legal News—Notes of Recent Decisions..... 360

Contract News 13

PAVEMENT GUARANTEES.

About one-third the municipal paving engineers who expressed an opinion on the subject of pavement guarantees in response to our questionnaire were in favor of such guarantees for all pavements, as detailed in our issue of March 15th. In this issue we summarize the opinions of county highway engineers on the subject, and of these also a little less than one-third are in favor of guarantees for all pavements; or about one-fourth of those who give their opinions as based on experience.

Many, probably the majority, of those who favor guarantees explain that they do so only because it seems to be the best way to insure the observance of specifications. It would seem to be in order for paving engineers to develop a direct method of securing such observance, either by adequate inspection or some other method.

MECHANICAL AGITATION FOR ACTIVATED SLUDGE.

A large part of the expense and of the difficulty attached to the activated sludge process of treating sewage is occasioned by the providing of large quantities of air supplied under pressure and diffused throughout the sewage. The function of this air has been considered to be two-fold—to supply oxygen to the sewage, and to maintain the activated sludge continuously intermingled with it. The latter is merely a mixing or agitating process and could be effected, it would seem, by other means, such as paddles or rapid flow through a baffled channel.

Experiments based on the idea of using other means of agitation have been made in England and are described briefly in this issue. These apparently demonstrated that not even for oxidation was applied air necessary, but that sufficient oxygen is absorbed at the surface if the sewage be kept in agitation. This promises to be a very important discovery in activated sludge treatment.

MOSQUITO EXTERMINATION AS AN INVESTMENT.

Every reader of newspaper jokes knows that the New Jersey suburbs of New York are famous for their mosquitoes. As a matter of fact, there are many other sections of the country where there are more mosquitoes to the cubic foot of air, but none where the number of human sufferers from them is so great. Or was so great, for New Jersey is fast losing its unenviable distinction.

A large proportion of northern New Jersey's pests breed in the marshes or so-called meadows along the Passaic and Hackensack rivers, which cover thousands of acres. The problem of preventing mosquito breeding

here was a most difficult and formidable one, but the state tackled it in 1905 and has been at it ever since, with help from Essex county, while the cities and towns in the vicinity gave more or less earnest assistance by cleaning up local breeding spots.

There are still mosquitoes in New Jersey, but it is no longer necessary to wear head nets when venturing out of doors in the evening. In fact, only for a day or two once in a while is there any noticeable visitation by the singing pests. Most significant of all, the very meadows themselves are habitable now, and many industries have sprung up there.

A considerable area of the mosquito-freed meadows are along Newark's water front. In 1905 this section paid $7,650 in taxes; in 1918 it paid $238,513. An annual income increment of $230,000 is 5 per cent on $4,600,000. If we assume that only half the increase is due to the waging of war on mosquitoes and also allow $10,000 a year for maintenance of the drainage works, we still have 5 per cent on $2,100,000. Just what the cost of the anti-mosquito work in this district has been we do not know, but feel quite certain that it has not been anything like two million dollars.

Even if this tax increase be neglected, a million and a half residents of communities near the meadows have benefitted; and there are very few of these who would not gladly pay one, two, five or more dollars apiece rather than suffer a reversion to previous conditions. Probably few if any of these mosquitoes were carriers of disease; but in other sections the anopholes are a serious problem of the health board. In general, the methods that eliminate one will eliminate the other as well; and any section suffering from these malaria-carriers should take steps to protect the inhabitants by destroying mosquito breeding places. In many cases they may find this financially remunerative, as did Newark. How one small local problem of this kind was solved is described in this issue.

IMPROVING PROVIDENCE WATER SUPPLY

A Temporary Dam and a Regulating Dam with Spillway of Horse-Shoe Shape—Completion of New Reservoir Will Permit the Elimination of Pumping.

By JOHN ROSITER HESS, Jr.

The waterworks of the city of Providence, R. I., now supplies about 290,000 consumers and the number is increasing at the rate of about 7,000 a year. The increase in consumption of water caused by the growth in population has reached the point where there is considerable danger of the supply being inadequate in case of a long continued drought. Also the present source of supply is highly polluted and it is necessary to carefully filter all of the water to render it safe. It was consequently thought desirable to secure a more abundant supply from a less polluted source than the present drainage area, which is densely populated by mill villages containing over 30,000 inhabitants, with no systematic means of disposing of mill and household wastes. The present supply is obtained from the Pawtuxet river, being pumped at the Pettaconset pumping sation, the present cost of pumping being about $230 a day. The amount of water drawn from the river is much greater than the natural low-water flow of the stream and the supply is maintained by reservoirs owned and operated by the mills and which furnish them with continuous power, the water being let down by them from these reservoirs as they may need it for manufacturing purposes. The dry-weather flow may be less than the city consumption for several months at a time, and it was considered a serious menace to the community that it should be compelled to rely upon these storage reservoirs.

The city accordingly decided to construct a new reservoir. This will extend north five miles from Kent, where the main dam will be built, to North Scituate village, part of which will be flooded upon the filling of the reservoir. The water surface of the reservoir will have an area of more than five square miles. Before the completion of this large reservoir, however, the city will use a smaller so-called regulating reservoir located at North Scituate and fed by the overflow of Moswansicut Lake. Hunting House brook and other streams which form Moswansicut river, one of the important feeders of Pawtuxet river. This regulating reservoir lies between the Danielson pike and Hartford pike, and is now filled,

VIEW OF REGULATING DAM TAKEN FROM BRIDGE.

the water having reached the top of the concrete spillway about the first of April.

Because of war conditions and prices, the construction of the main dam at Kent has been postponed, but the completion of the upper regulating reservoir at the earliest possible date seemed a necessity. Surveys for condemning land for this reservoir were completed by the end of 1916 and the building of the dam, the raising of the highways, and clearing of the land were accomplished during the fall and winter of 1918. The reservoir formed by this North Scituate dam holds about 430,000,000 gallons and receives drainage from an area of about twenty-two square miles. This water can be sent down the Pawtuxet river to the present pumping station as it may be needed.

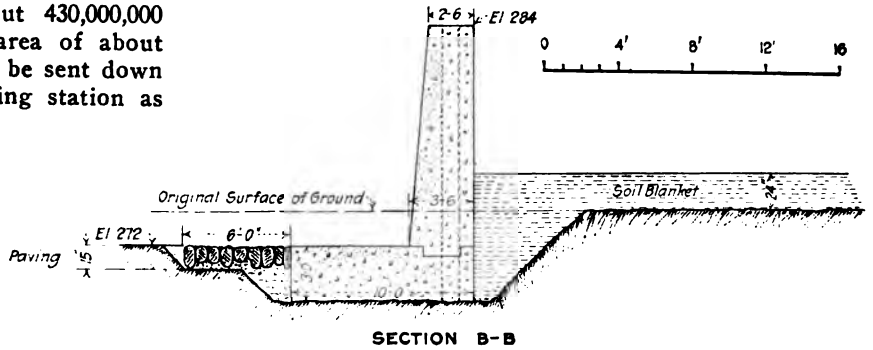
It is estimated that it will require four years from the letting of the contract to construct the main dam, and at least one year to fill the reservoir sufficiently to permit sending the water to the city. Plans and specifications for the construction of other earth roads in connection with the Scituate reservoir are in preparation, as are also those for the main dam and dike, and it is hoped to have contracts let for both of these this year.*

*Bids for part of this work were received April 23.

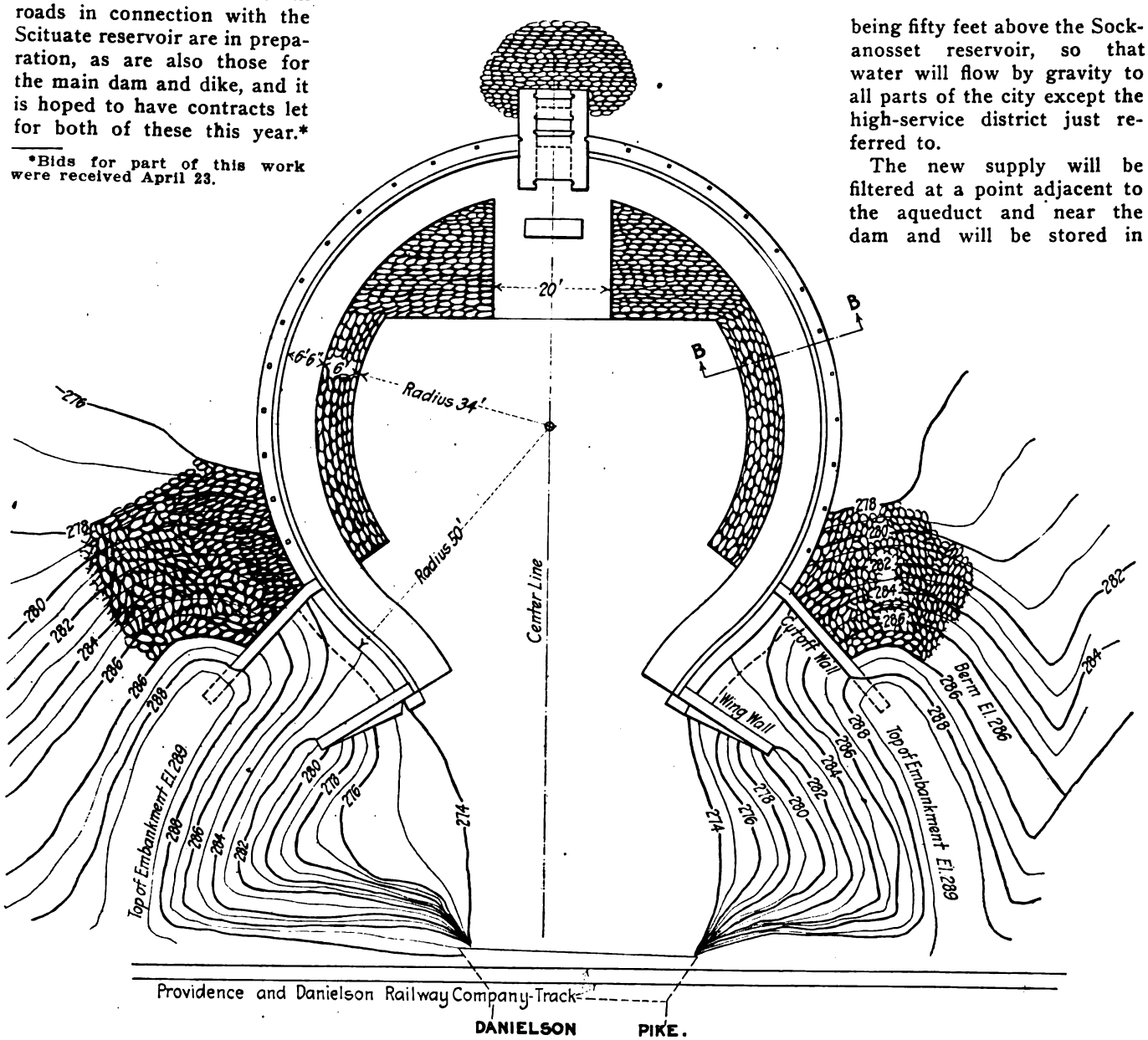
The main dam and dike will be built mainly of earth, of which about 2,500,000 cubic yards will need be handled.

The pumping station at Pettaconset is approximately ten feet above tide water. The water from the river is filtered and then pumped to the Sockanosset reservoir, which is 182 feet above sea level. A limited area is served by pumping again with high-service pumps. This pumping and filter plant will be discontinued when the reservoirs have been completed and filled, their elevation being fifty feet above the Sockanosset reservoir, so that water will flow by gravity to all parts of the city except the high-service district just referred to.

The new supply will be filtered at a point adjacent to the aqueduct and near the dam and will be stored in



SECTION B-B



SCITUATE RESERVOIR REGULATING DAM.

covered reservoirs to prevent algae growth. It is estimated that the completion of the present project, which will cost about $15,000,000, will insure a supply of excellent water, sufficient for forty of fifty years of normal growth.

TEMPORARY TIMBER DAM.

In addition to the North Scituate dam, there has been constructed a temporary dam across the Pawtuxet river at the Pettaconset pumping station, which will be abandoned when the pumping station is abandoned, upon the completion of the Scituate reservoir. This temporary reservoir serves as an equalizer of stream flow past the present pumping station and will furnish a reserve supply from which to pump during periods of low-stream flow when the mills are shut down and the flow of the stream is being held back in their mill ponds. This and the North Scituate reservoir combined hold a reserve supply sufficient for thirty days.

This temporary dam will impound about 44,000,000 gallons. It is of six-inch planks, grooved and splined, with a plank apron on each side, rip-rapped on the lower side and filled in under the apron on the upper side with impervious soil. Adjustable flashboards about 10½ feet long are cut into the crosswalls, which act as bracing. The cross-walls are of six-inch grooved and splined planks and the tops are connected to form a walk across the entire length of the dam. The dam is 210 feet long, 100 feet of which is in the river and the remainder is extensions into the flat shores. Construction on this began in July, 1918, and was continued until cold weather, with the idea of renewing it this spring and completing it by August 1st. The contractors for the temporary dam are F. E. Shaw & Co.

ONE END OF SPILLWAY, SHOWING CUT-OFF WALL AND WING WALL.

THE NORTH SCITUATE DAM.

The reservoir at North Scituate covers the area lying above the Danielson pike, which is carried across the valley of the stream on an embankment, the stream flowing under a bridge in this embankment. The road embankment is used as a part of the dam for impounding the water. Instead of building a straight spillway at the bridge itself, however, which would not have given anything like the length of overflow necessary, one was built about fifty feet above the bridge and connected with the road embankment by short spur embankments sixty or seventy feet long. The overflow section or spillway, is of concrete and in plan takes the shape of an arc of a circle with a central angle of 280 degress, the water overflowing into the partially enclosed basin thus formed and passing through the open section of the circle, which is directly opposite the bridge. The upstream or wetted face of the spillway has a radius of fifty feet, and is vertical. The top is flat, two and a half feet wide, and the downstream face has a batter of twelve inches in its total height of twelve feet. The spillway rests upon a base of concrete three feet thick, which extends for six and a half feet in front of the wall, and thus inside the basin, to act as an apron. This apron is extended six feet further by stone paving.

In the middle of the arc of the spillway, directly opposite the outlet of the basin, is an outlet tower, by which the discharge from the reservoir can be controlled. Directly opposite the lower opening in this tower is a baffle wall ten feet wide and three feet thick, against which the discharged water impinges and by which it is diverted to the right and left so as to spread over the basin. In front of the upper face of the tower, the bottom of the reservoir is paved with stone with grouted joints, the paved area being about twenty-five feet in diameter. In front of the outlet of the tower, in the basin, is a concrete apron twenty feet wide and twenty-seven feet long.

The spillway wall was made in 40-foot sections with vertical expansion joints of the tongue and groove type, the tongue being twelve inches wide at its base, eleven and a half at its top, and six inches deep. The face of each expansion joint was painted with a cold-water paint before the concrete of the adjoining section was run. Similar joints were placed in the concrete base and apron and directly under those in the wall. In the top of the wall are placed twenty-four vertical recesses to receive standards for supporting flashboards, provision being made for using flashboards to a height of eighteen inches.

At each end of the circular wall, at the outlet of the basin, are wing walls at right angles to the circular wall, their tops being at an elevation two feet lower than that of the wall. Twenty-five back from each wing wall is a cut-off wall, which extends for twenty-five feet into the embankment and rises to an elevation four feet higher than the crest of the spillway. These cut-off walls not only serve to prevent leakage around the spillway through the embankment, but also determine the end of the overflow section of the wall. The face of the embankment at the junction of each cut-off wall with the spillway wall and for about twenty to forty feet therefrom, is faced with a double layer of rip rap. The slope of the embankment on the up-stream side is two and a half to one and that on the down stream side is two to one. The crest of the spillway is 284 feet above mean tide water at Providence harbor, which is the elevation adopted for the surface of the proposed main reservoir, which will be separated by the Danielson pike from the reservoir just completed.

The masonry was founded on a gravelly soil of moderate water-tightness, the base being placed about five feet below the original surface of the ground. In order to prevent leakage of water under the dam, a blanket of impervious soil two feet thick was placed on the original surface for a distance of seventy-five feet from the spillway.

The construction of the North Scituate dam was done by contract by the E. W. Foley Contracting Corporation of New York, which was the lowest bidder. The work

was in charge of Frank E. Winsor, chief engineer for the water supply board. Work was begun September 2d, 1918, and was completed December 20th, 1918, and the water in the reservoir had raised to the level of the spillway about April 1st of this year. The work at the Pettaconset dam is in charge of Milton A. Bronson, city engineer of Providence.

COST OF CONCRETE BRIDGES.

We have received several inquiries as to probable cost of concrete bridges in view of prevailing high prices, and the following figures may prove of interest, which figures were sent us through the courtesy of Walter E. Emery, superintendent of highways of Peoria county, Ill:

Early in April contracts for five reinforced concrete bridges were let, the bid in each case being a lump sum for the completed structure, the prices including excavating for foundations and walls, cleaning out the channel, removing old structure where there was one, but not constructing the road surface on the bridge. The total bids and the same reduced to cost per cubic yard of concrete were: Sturm's Creek bridge, $1,012.80, or $24 per cubic yard; Clark's bridge (superstructure only), $849, or $22.34 per cubic yard; Edward's bridge, $2,140, or $20.75 per cubic yard; Walnut Ford bridge, $1,924, or $22 per cubic yard, or $16.35 per cubic yard if of plain concrete; Duffy's Creek bridge, $2,375, or $24.50 per cubic yard.

A HIGH-COST HIGHWAY.

The state of New Jersey, in constructing its section of the Lincoln highway, is spending an unusual amount per mile in an effort not only to render it as nearly perfect as possible for the present, but also to give it as long a life as could reasonably be expected. This section of the highway is 65 miles long and has for some time been carrying a volume of traffic estimated at over two thousand tons a day. The state is now reconstructing with concrete two sections totaling seventeen and a half miles at a cost of $1,157,264, or an average of more than $66,000 a mile. One of these required relocation of the route in order to eliminate thirteen dangerously sharp turns and a grade crossing of the Pennsylvania railroad. Many thousand dollars were spent for acquiring new rights of way, grading and drainage. Two miles of the other section required even more of this special work, $50,000 being spent for drainage alone.

The concrete pavement is being laid eighteen feet wide, eight inches thick at the sides and ten and a half at the center, or almost an inch thicker than the heaviest type of concrete road laid previously and considerably thicker than the greater part of such road as it is laid in many parts of the country. On each side of the concrete will be a three-foot macadam shoulder.

PARKING AUTOMOBILES RUINS ASPHALT.

Broad street, Columbus, O., between High and Third streets, has been used for parking automobiles, the vehicles occupying the center of the street. The street is paved with asphalt, except along the curbs, where wide stone block gutters were laid with the idea that these instead of the center of the street would be used for parking motor vehicles. At the recommendation of city engineer Maetzel and W. H. Eagle, city superintendent of asphalt, council on April 7th adopted an ordinance changing the parking space from the center to the south side of the street.

Superintendent Eagle's reasons for advocating this were as follows:

"1. When the street was paved it was designed with the idea of parking machines along either curb. To this end, wide stone block gutters were constructed along each curb. Had we known that it was intended to park in the center of the street, a different design would have been followed.

"2. Continued parking on the asphalt in the center of the street will seriously injure the asphalt paving. Continued dropping of oil and gasoline on asphalt will make it so soft that it will become wavy or uneven, and be very unsuitable for traffic. When warm weather comes and the asphalt gets soft, the wheels of machines will sink into the asphalt, if allowed to stand all day, and pavement will be full of ruts.

"3. Another objection is that with the center of the street occupied with machines during the day time, the street cleaning department is unable to clean this portion of the street and it presents an untidy appearance aggravated by oil that has dripped from machines, which holds dust and dirt, making it very difficult to clean."

A PROBLEM IN ANOPHELES ELIMINATION.

Preventing Breeding in Shallow Edges of Pond by Use of Cofferdams and Drains, and by Filling In.

In connection with a campaign to reduce malaria and, incidentally, mosquitoes in a small mill village and vicinity in Louisiana the problem of control from a mosquito-producing standpoint of the mill pond became most important. This mill pond, with an area of not more than ten acres, was an almost ideal mosquito-breeding section. The greater part of its surface was so covered with grass, water lilies and other aquatic growths that the mosquito larvae were safe from the minnows found in large numbers in the deeper water. Over a large part of the pond the water was less than eighteen inches deep. The general shape of the pond and the shallow areas are shown in the accompanying sketch.

With the dry season approaching it was not possible to waste enough water to dry up the shallow areas as the operation of the mill was dependent upon an adequate water supply; and in addition to being the main support of the villagers the mill was engaged in furnishing lumber for war work, and its full-time operation was a matter of some importance.

Several plans were considered for the control of breeding in the mill pond, oiling from spray cans being used as a temporary expedient while permanent work was in progress. The choice finally resolved itself into one of three methods as follows:

1. By means of men, either wading or in boats or on rafts, to grub up all growths, removing the vegetation which clogged the water and prevented the fish from destroying the mosquito larvae.

2. Building bulkheads along the edge of the shallow areas and filling behind these with earth, rubbish, sawdust or other material. In connection with this method, the construction of a flume from the sawdust pile about 1,000 feet away and the transportation by water carriage of sawdust for filling was considered.

3. The drainage of the shallow areas.

The first method was considered too costly, inasmuch as at the best it would be but a temporary expedient. It was thought likely that before the end of the mosquito season another growth would have sprung up, while the

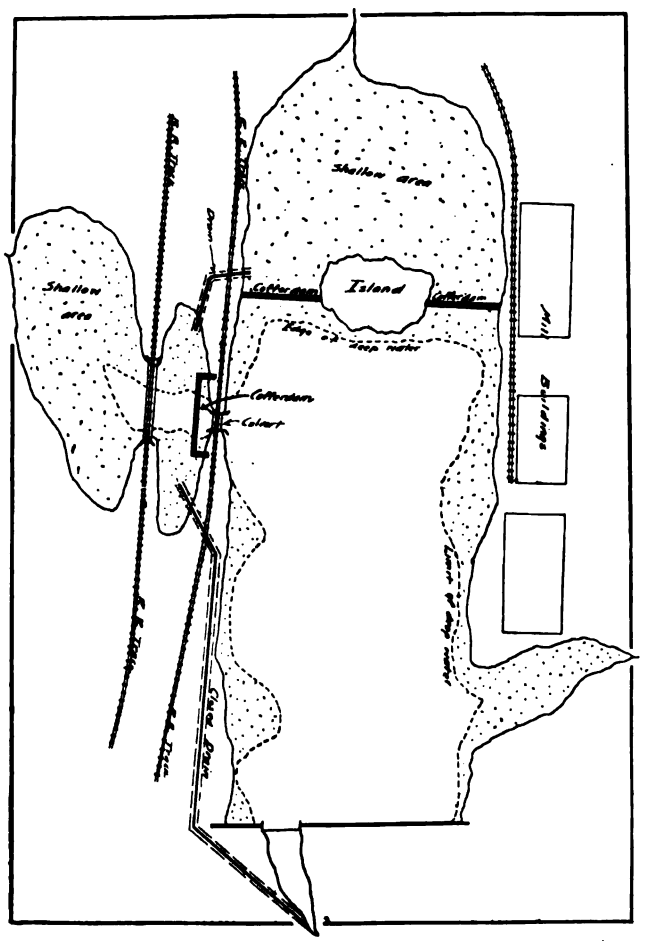
work would certainly have to be repeated with every season.

The second plan was considered costly and having certain points in its disfavor, such as flood damage; but was abandoned mainly because nearby sources of material for filling were inadequate and a long haul would have been necessary to secure enough filling to complete the work.

It was finally decided to drain most of the shallow areas and to fill those areas which could not be economically drained. The fact that all the feeding streams to the pond flowed through the shallow areas complicated matters, but a general plan was adopted along the following lines:

A coffer-dam, with its top at an elevation slightly above the level of the spillway of the pond, would be constructed between the small island that marked the lower end of the shallow area in the north end of the pond and the shores of the pond opposite, thus cutting off from the deeper water a considerable shallow area. The west shallow arm was also to be cut off by means of a one-way flow gate in the culvert under the easterly of the two railroads. The shallow areas were then to be drained by means of a ditch leading south between the two railroads and finally turning into the stream again below the dam.

This, of course, practically cut off all the flow into the pond, but it was found that the ordinary dry-weather flow of the feeding streams was not sufficient to make up the evaporation loss on the shallow areas. By constricting the entrance to the drainage ditch it was believed that storm flow would fill up these drained shallow areas and overflow the coffer-dams into the lake in sufficient volume to supply all water needs.



SKETCH OF POND, SHOWING METHOD OF TREATMENT.

This plan left untreated some small areas along each side of the pond and a small bay on the east side. These were to be bulkheaded and filled where they could not be cleaned economically.

The scheme was successfully carried out as outlined above with a few minor exceptions, including the location of the ditch and the type of storm gate in the culvert under the railroad.

The ditch draining these places had originally been designed as an open ditch mainly because it was feared that a closed drain might be clogged from the large amount of debris carried by the very violent storms that occur in this section of Louisiana; but in excavating for the ditch a very fine white sand was encountered, which, when wet, flowed almost like water. It was therefore necessary to abandon the open ditch. With a closed drain necessary, it was decided to transfer it from the previous location between the railroads to the narrow strip between the pond and the easterly of the two railroads, since considerable excavation was saved by the new location. A wooden box drain was used, with manholes at frequent intervals, and this was placed low enough to almost completely drain the areas cut off by the coffer-dams. To care for the area beyond the railroad track and north of the island a small culvert was constructed under the railroad track.

A swing gate, to open only when the head of water became greater on the western side, had been planned for the 6-foot by 6-foot culvert under the track and connecting the western arm with the main body of the lake. The railroad engineers insisted on an almost clear opening through this culvert for possible storm conditions, as, according to their run-off formula, a clear opening of this size was necessary. As stated, in time of storms (which are usually violent) a great deal of drift and debris is carried, and this, it was feared, would obstruct such a gate and either cause it to remain open, thus draining the pond, or to prevent free opening and cause overflow of the tracks.

It was therefore decided to leave the culvert free and clear and to construct about it, on the west side, a coffer-dam of such length that, with an overflow depth of one foot, the heaviest recorded storm flow would be taken care of.

All coffer-dams were constructed of 2 x 6 timbers, driven about 6 feet into the bottom of the pond, lapped with inch board to make them tight and braced with 4 x 6 timbers. The coffer-dams were cut off at a height four inches above the level of the spillway of the pond. With this work completed and with the remaining low areas filled or cleaned, the pond was no longer a sanitary menace. No accurate statement of the cost can be given, as part was by contract and the remainder by day labor, while much of the timber was picked up here and there about the mill; but the cost was approximately $1,300.

HOG FEEDING IN SPOKANE.

Since the termination of war operations the amount of garbage reaching the garbage pails in Spokane, Washington, has been increasing, and the amount disposed of by the Crematory Division during the month of March, 1919, was greater by 14 per cent than that disposed of in March, 1918, and slightly more than in March, 1917. This drifting back to pre-war extravagance raised the question of garbage disposal and the utilization of wastes, and a plan has been developed and arrangements made whereby Seattle's garbage will be collected without cost to the householders and will be utilized for feeding hogs.

Hog feeders have agreed to purchase, at cost of collection, all edible garbage delivered to them at the crematory plant. To secure the co-operation of the public in the matter the Crematory Division will collect without cost to the householders an amount of inedible waste equal in volume to the edible waste collected. In order to take advantage of this plan, the householder must furnish proper waste receptacles with covers and handles. The waste materials must be carefully segregated and only the edible material placed in what is termed the garbage can. This can must be scalded from time to time. The cans to be collected under this plan will be placed on the edge of the street adjoining the premises or at the rear of the lot. Any householder producing edible waste which is now being disposed of by burning, either in range or by sending to the crematory, may have it collected under the above plan by telephoning to the Crematory Division. Arthur E. Peterson, the superintendent of the division, to whom we are indebted for this information, is endeavoring to secure the complete co-operation of the public, which is necessary to make the plan a success.

PAVEMENT GUARANTEES.

Practices of Counties Throughout the Country as to Requiring Them, and Opinions of County Officials as to Desirability of Them.

The report of a committee of the American Road Builders' Association on the subject of requiring contractors for pavement construction to guarantee the pavements was published and commented on in the March 8th issue of Municipal Journal; and in the issue of March 15 a summary was given of the opinions of several hundred city engineers on the subject.

Desiring to know how county highway officials felt on this subject, we included questions concerning it in the questionnaire sent to such officials during the latter part of March, these questions being as follows: "Does your county require contractors to give guarantee bonds?" "For how long a period is the guarantee?" "Do you consider guarantees desirable for all kinds of pavement?" "If not, for what kinds is it desirable?" "Have you formed conclusions from any personal experience that are favorable to or against pavement guarantees?"

The answers to all but the last question were given in tabular form in our issue of April 19. These replies may be summarized as follows:

"Does your county require contractors to give guarantee bonds?" Of the 123 countries replying, 47 require guarantees (one specifying "for maintenance" and two "for faithful performance of contract"); 10 require them for some kinds of pavement or certain classes of work; 2 expect to later on; and 54 do not require guarantees; while 10 do no road work by contract.

"For how long a period is the guarantee?" Seven report 1 year; one, 1 to 2 years; one, 1 to 5 years; one, 2 years; one, 2 or 3 years; one, 3 years; one, 3 years for brick; one, 4 to 10 years; eleven, 5 years; one, 5 to 10 years; two, 10 years; fifteen, until work is completed; one, at the engineer's discretion; and four state that the time is not fixed.

"Do you consider guarantees desirable for all kinds of pavement?" 28 answer yes, and 61 answer no.

"If not, for what kinds is it desirable?" The replies to this were almost too varied to summarize. Four named asphalt only, six named asphalt and other kinds of pavement; seven named brick as one of several; one named concrete alone, and eight as one of several. Four thought guarantees desirable for all hard pavements, several for all bituminous pavements; while "patented pavements," "better types," and "gravel roads" were among the other answers.

The answers to the last question can be divided into those whose experience had led them to favor guarantees and those whose experience was unfavorable. Those in the first class were: E. C. Minton, county engineer of Tippecanoe Co., Indiana; C. E. Stebbins, county engineer of Allen Co., Kansas ("Desirable for all kinds of pavement") and H. L. McNary, county clerk of Anderson Co., Kansas, who uses the same words; W. S. Merrile, county highway engineer of Kalkaska Co., Michigan; Walter J. Lehner, county engineer of Macomb Co., Michigan ("We believe them to be good insurance for proper workmanship and material"); Thos. S. Leavitt, county highway engineer of Polk Co., Missouri; Wm. C. Cattell, county engineer of Gloucester Co., New Jersey ("Believe guarantee bond increases cost, but believe in bond for performance of contract"); Garwood Ferguson, county engineer of Passaic Co., New Jersey ("A guarantee is desirable for a period of from one to two years as it makes irresponsible contractors, who might have a contract, perform their work in a better manner"); D. L. Peters, superintendent of roads of Luna Co., New Mexico; C. Grossman, county highway engineer of Lewis Co., Tennessee; H. A. Murray, county engineer of Kittitas Co., Washington.

Those whose experience leads them to oppose guarantees were: W. M. Francisco, of Lake Co., Florida; A. R. Carter, county superintendent of Highways of Winnebago Co., Illinois; E. B. Douglas, county surveyor and engineer of Jackson Co., Indiana ("Better spend money for competent, honest inspectors"); John J. Griffith, county engineer of Marion Co., Indiana ("Guarantees make pavement cost more"); Ray H. Bower, Tipton Co., Indiana; Robt. E. Gibbons, county engineer of Vigo Co., Indiana; Howard H. Horton, county engineer of Wayne Co., Indiana ("Can take care of repairs at less cost to us"); R. E. Robertson, county engineer of Cerro Gordo Co., Iowa ("Guarantee desirable only when contractor is putting in the work by his own specifications"); Edw. Cook, county engineer of Chase Co., Kansas; Wm. S. Canning, county engineer of Henderson Co., Kentucky ("Should not both specify how to be done and then require guarantee of results"); E. T. Hayman, county road engineer of Anne Arundel Co., Maryland ("Desirable only for patented pavement; we do not contemplate or expect to permit any further patented pavement construction"); Geo. P. Trax, road engineer of Talbot Co., Maryland; D. P. Smith, Case Co., Michigan; H. J. Brown, county engineer of Lincoln Co., Missouri; Joshua Doughty, Jr., county engineer of Somerset Co., New Jersey; W. J. Hardin, acting county engineer of Sussex Co., New Jersey; Thos. M. Brennen, superintendent of highways of Niagara Co., New York ("No engineer has a moral right to require a contractor to follow specifications that the contractor may know to be faulty and then require him to give bonds"); John E. Hodgman, county engineer of Saratoga Co., New York; Matthew McEvoy, superintendent of highways of Yates Co., New York; J. H. Asher, county surveyor of Madison Co., Ohio; Ralph Strait, county surveyor of Muskingum Co., Ohio; John F. Gallier, county surveyor of Wood Co., Ohio; T. P. Paxton, commissioner of public works of Okmulgee Co., Oklahoma; C. E. Coile, county engineer of Green Co., Tennessee ("Do not con-

sider maintenance guarantees desirable for any kind of standard pavement. Have never had a yard to fail"); Guy G. Harvey, district engineer, Lincoln Co., Washington; E. A. White, county engineer of Pierce Co., Washington; J. K. McGrath, road engineer of Fayette Co., West Virginia ("All experience has been against"); J. R. Wilson, county road engineer of Harrison Co., West Virginia ("Contractors put about 15% on bids to cover same when repairs do not run 5%"); and Philip J. Walsh, engineer and general superintendent of Kanawha Co., West Virginia.

These opinions of county officials, said to be based of guarantees, although about half of the counties follow on experience, show only about one-fourth in favor the practice of requiring them.

ACTIVATED SLUDGE WITHOUT COMPRESSED AIR.

Experiments at Sheffield, England, Indicate Possibility of Substituting Mechanical Stirring for Use of Compressed Air—Aerated by Surface Absorption.

Early in 1916 some experiments were begun at the sewage treatment works of Sheffield, England, in treating sewage by the activated sludge method without the use of compressed air, which experiments have been continued and are to be extended in scope. They have been in charge of John Haworth, chemist and manager of the Sheffield Corporation Sewage Works, and are briefly described by him in a recent issue of Municipal Engineering of London, England. He has recently constructed two tanks for making experiments on a larger scale, which are treating 50,000 to 60,000 gallons of trade sewage per day.

Early in 1916 a tank of 800 gallons capacity was fitted with a paddle stirrer, and with an apparatus for inducing air mechanically. After this tank had been in use for some time it was found that by suitably regulating the revolutions of the paddle, purification could be obtained satisfactorily to the extent of at least three fillings of the tank per day, without the use of the aerator. The tank has been operated during the last two years in this manner.

The results of this and other experiments led to the conclusion that, given suitable agitation to obtain thorough intermixing of the activated sludge with the sewage and to prevent settlement, the necessary air required to maintain the biological activity might be obtained by surface aeration. To accomplish this it was found necessary to produce constant change of surface of the liquid.

The question also suggested itself, and is worthy of investigation, whether in the case of systems where air is blown through the sewage, the aeration is not largely brought about by solution at the surface, by reason of the large disturbance and change of surface exposed by the rising bubbles, rather than by solution of oxygen from the bubbles themselves. It was evident that, except in the case of small tanks, the horizontal paddle type of agitator would not be quite suitable, and two tanks of a different type have recently been designed and put into operation.

The tanks are 30 feet by 14 feet by 4 feet deep, with level floors. Division walls have been constructed to form a continuous channel, approximately 3 feet 3 inches wide, along which the sewage can circulate and return to an agitator placed at one end of the tank. The agitator consists of two vertical pistons of the Root's blower type. On rotating the agitators, the sewage is circulated at a velocity sufficient to prevent settlement of the sludge. A velocity of 1½ feet to 2 feet per second has been found ample to accomplish this result. A mechanical aerator was fixed in one of the tanks, in case additional air was required, but it has been found unnecessary. By means of the agitators and the special construction of the tanks, constant change of surface occurs. One tank was put into regular use in October last. Humus, washed from material taken from a contact bed, was put in to a depth of about 6 inches, and the tank filled with sewage.

After ten days' agitation the sludge was completely coagulated and flocculent, and found to be sufficiently activated to allow the experiment to proceed. The tank was then worked on the fill-and-draw principle, and has purified sewage satisfactorily and continuously during the last three months, three fillings of the tank per day being dealt with. The liquid treated is an industrial sewage, containing at times a large proportion of iron liquors, soaps, etc. These at times have required extended periods of treatment.

The accompanying table indicates the character of the sewage dealt with and the results obtained.

The power absorbed by the process described is calculated at 20 horsepower per million gallons, but there appears no doubt that the agitators employed could operate a much larger tank with only a slight additional power consumption. There is no doubt that a variety of types of agitator might be devised to operate such a process, probably with greater efficiency. Several types are at present under consideration. The sewage disposal committee of the corporation have already authorized the extension of the experiments to deal with the whole of the flow of their Tinsley works as soon as suitable plant can be obtained.

LIME FOR ILLINOIS CONCRETE ROADS.

It is reported that the Illinois state highway department has decided to try the use of hydrated lime on three half-mile sections of concrete road in the vicinity of Chicago, provided that manufacturers of the lime donate the fifty to sixty tons of that material that would be required.

TEXAS HIGHWAYS UNDER CONSTRUCTION.

The report for May 3 of Geo. A. Duren, state highway engineer of Texas, shows that 7 of the 389 projects for state improvement of highways have been completed, totaling about 125 miles; there are under construction 80 projects, totaling 1126 miles and estimated to cost $4,862,474; and there are under contract 87 projects. The total amount paid out to date was $554,767.

Analysis of Samples from Experimental Aeration Plant, Sheffield Sewage Works, from November 27, 1918, to January 31, 1919.—Number of Samples, 45.—Results in parts per 100,000.

	Sewage			Effluent		
	Best.	Worst.	Average.	Best.	Worst.	Average.
Suspended solids	11.6	69.8	34.20	—	—	—
Oxygen absorbed in four hours	3.32	13.38	7.10	.15	.60	.32
Free and saline ammonia	1.224	6.41	3.34	.039	2.275	.424
Albuminoid ammonia	.304	1.74	.751	.022	.129	.05
Chlorine	6.7	16.8	9.8	6.4	16.0	9.29
Nitric nitrogen	—	—	—	1.55	.16	.75
Dissolved oxygen taken in five days at 65 deg. Fah.	—	—	—	.013	.389	.153

NEWS OF THE SOCIETIES

May 19-24.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Atlantic City, N. J. Secretary, T. C. Martin, 29 W. 39th St., New York.

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

June 17-19.—TRI-STATE WATER AND LIGHT ASSOCIATION OF CAROLINAS AND GEORGIA. Ninth annual convention, Greenworth, S. C. Secretary treasurer, W. F. Stieglitz, Columbia, S. C.

June 17-20.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, St. Paul-Minneapolis. Secretary, Charles W. Hunt, 33 W. 39th St., New York, N. Y.

June 23-26. — SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, Coates House, Kansas City, Mo. Secretary, E. L. Fulkerson, 617 Washington St., Waco, Tex.

June 24-27.—AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University of Pennsylvania.

June 24-27.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

Oct. 27-30.—AMERICAN PUBLIC HEALTH ASSOCIATION. Annual meeting, New Orleans, La. Secretary, A. W. Hedrich, 169 Massachusetts ave., Boston, Mass.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Springfield, Ill.

National Electric Light Association.

The forty-second annual convention of the National Light Association will be held at Atlantic City, May 19 to 22. Some of the features of the program follow:

At the first general and executive session, held Tuesday morning, Alex Dow, Detroit Edison Co., will report as chairman of the rate research committee; E. E. LaSchum, New York, general superintendent, American Railway Express Co., will read a paper on "The Electric Truck in Modern Transportation."

The second general and executive session, on Tuesday evening, will deal with questions of public policy. There will be a paper on "Sale of Securities to Customers and Resident Citizens," by W. H. Hodge, Chicago, H. M. Byllesky & Co.; W. W. Freeman, Cincinnati, Union Gas & Electric Co., will report as chairman of the public policy committee, and T. W. Lieb, New York, New York Edison Co., for the National Committee on Gas and Electric Service.

The third session, on Wednesday morning, will be devoted to association matters and to an address on "Regional Power Systems," by Dr. George Otis Smith, Washington, Geological Survey, Department of the Interior.

At the fourth session, Thursday morning, a number of committees will report, including the following, under the chairmen named: Safety rules and accident prevention (William C. Eglin, Philadelphia Electric Co.); lamps (Frank W. Smith, New York, United Electric Light & Power Co.); form of annual report to commissions (W. J. Myers, New York, United Light & Power Co.). Professor Joseph W. Richards, Lehigh University, secretary, American Electrochemical Society, will read a paper on "The Importance of Electrochemistry."

The Accounting Sections will meet on Tuesday and Wednesday afternoons, when the following committees will report: Cost accounting and statistics (A. D. Spencer, Detroit Edison Co.); commission accounting rulings (H. E. Addenbrooke, Chicago, Commonwealth Edison Co.); operating records (C. A. White, Edison Electric Illuminating Co. of Boston); purchasing and storeroom accounting (W. F. Stevens, Edison Electric Illuminating Co. of Boston); customers' records and billing (H. C. Schlegel, New York Edison Co.).

The commercial section will hold five sessions, of which some of the features will be reports by the following committees: Commercial service and relations with customers (R. F. Bonsall, Consolidated Gas, Electric Light and Power Co. of Baltimore); wiring (R. S. Hale, Edison Electric Illuminating Co. of Boston); commercial aspects of lamp equipment (O. R. Hogue, Chicago, Commonwealth Edison Co.); commercial aspects of street and highway lights (C. G. Durfee, Rochester Railway & Light Co.); residence lighting (C. W. Johnson, Jackson, Hodenpyl, Hardy & Co.); outdoor lighting (H. H. Magdsick, Cleveland, National Lamp Works); lighting of public buildings (G. Bertram Regan, Philadelphia Electric Co.); store lighting (A. L. Powell, Harrison, General Electric Co.). Before the power sales bureau on Wednesday afternoon, there will be a discussion on "Effect of War on Isolated Plant Costs," led by I. Lundgaard, Rochester Railway & Light Co., and a paper on "Power Factor in Customers' Installations," with discussion led by R. H. Knowlton, Philadelphia, United Gas Improvement Co. The electric range committee will discuss the possibilities of increasing that business. On Wednesday evening, the power sales bureau, at a dinner, will hear a paper on "Electric Industrial Trucks and Tractors and Their Relation to the

(Continued on page 358)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Cumberland county, Portland, Me., contemplates building a highway and trolley BRIDGE, to cost $1,000,000. The consulting engineer is A. W. Pease.

Red Wing, Minn., contemplates the construction of an ELECTRIC LIGHT and POWER PLANT to cost $350,000. The consulting engineer is L. P. Wolff.

Garvin county, Pauls Valley, Okla., is to make ROAD IMPROVEMENTS to cost $69,000, including roads and bridges. The plans were prepared by the consulting engineer, W. E. Moore.

Swainsboro, Ga., will vote on issuance of $50,000 of bonds for installing WATERWORKS and SEWERS, according to plans prepared by the consulting engineers, the J. B. McCrary Co.

SEWERAGE and WATERWORKS IMPROVEMENTS are to be made by Picher, Okla. $170,000 will be expended for waterworks and $80,000 for sewers, for which bonds have been carried. The consulting engineers are Mackintosh & Walton.

Henryetta, Okla., voted $310,000 WATERWORKS IMPROVEMENT bonds, covering additions to pumping equipment, filtration plant, settling basins, supply line and distribution system. The consulting engineers are Burns & McDonnell.

Arkansas City, Kan., is to build a concrete STORM SEWER, for which plans have been prepared by the consulting engineer, Charles E. McCrae.

Cleveland Heights, O., is to make PAVING IMPROVEMENTS in various streets, according to plans prepared by the consulting engineers, the F. A. Pease Engineering Co.

SEWERAGE and WATERWORKS IMPROVEMENTS are to be made by the city of Niles, Mich., to cost $118,000. The consulting engineer is Chas. W. Cole.

Lindsay, Okla., is to make SEWERAGE IMPROVEMENTS, including sewage disposal plant, to cost $65,000, for which plans have been prepared by the consulting engineers, the Benham Engineering Co.

Preliminary plans have been adopted by the city of Columbia, Ill., for additions to the ELECTRIC LIGHT and POWER PLANT, consisting of extension to building, and new generating equipment. The consulting engineers are the firm of Fuller & Beard.

Rock Port, Mo., is to make SEWERAGE IMPROVEMENTS, for which bids have been advertised, consisting of approximately three miles of vitrified pipe sewers. The consulting engineers are W. B. Rollins & Co.

INDUSTRIAL NEWS

Price Stabilization Plans Collapse.

An open market has been created in the steel industry, representatives of the Railroad Administration and members of the General Committee of the American Iron and Steel Institute having failed to agree on minimum stabilization prices, after repeated conferences. The steel manufacturers refused to make any concession in prices to the Railroad Administration officials, maintaining that costs were so high that reductions were impossible at the present time without cutting wages. It was the contention of the Railroad Administration that the steel companies could make profits on the price schedule agreed upon between the producers and the Industrial Board of the Department of Commerce, nearly equal to those which were rolled up during the war period.

This marks the final collapse of the price stabilization plans of the Administration attempted through the Industrial Board. The resignations of all members of that board, including that of chairman Peek, have been in the hands of Secretary Redfield for some weeks. Following the first deadlock between the Railroad Administration and the Industrial Board, it is understood that President Wilson urged further conferences. These have now proved futile. Chairman Peek, in a number of controversial statements, lays the blame on sinister influences, but the real causes of the collapse of the plan and the motives of those concerned are not understood.

According to leading steel producers, the recognized open market will mean higher prices on steel products rather than lower. Bidding in general has a tendency at present to hold to the prices agreed upon by the Industrial Board, but some producers are already quoting higher.

Markets for Sewer Pipe.

According to consul general H. W. Harris, Habana, Cuba, about 600 carloads of vitrified pipe are said to be imported into Cuba annually. The matter of sewerage in municipalities receives less prompt attention than in the United States, owing to the difficulty of financing municipal improvements. But there is said to be considerable demand here for various sizes of pipe on the large modern sugar plantations for sewerage, culvert, drainage, and other purposes. Many of these plantations have railway lines of 50 to 100 miles in extent. Large pipe is used on many of these lines for culvert purposes. For surface water and other drainage Cuba relies to a considerable extent on cement pipe.

Consul William Dawson, Montevideo, Uruguay, reports that Uruguay should offer a good market for vitrified sewer pipe during the next ten years. Projects are already on foot for sanitation work in sixteen interior cities, as well as sewerage in the outlying districts of Montevideo. The work has not as yet been authorized, but it seems highly probable that much of it will be undertaken. An American contractor estimates that some $10,000,000 worth of necessary sanitation work will be executed in this country in the comparatively near future.

The principal competitors of American vitrified pipe will be the English product and cement pipe made on the spot. English pipe is already well introduced here, practically all the vitrified pipe used having come from England. In addition to familiarity with the product, the English manufacturer has the further advantage of complying more closely with local requirements. The American standard vitrified pipe will not satisfy local specifications, particularly as respects porosity, and many American manufacturers would probably have to turn out a special grade for this market.

As respects cement pipe, an American contracting concern which recently put in sewerage works in three Uruguayan cities made its pipe on the spot. This proved particularly advantageous on account of the shortage of vessels and high freights. Under normal conditions vitrified pipe will probably receive the preference if it can approach cement pipe in price. Cement is manufactured by a Uruguayan concern having a capacity of 400,000 barrels per year.

The American-La France Fire Engine Co., Inc., Elmira, N. Y., announces the recent receipt of the following orders for equipment: Belize, British Honduras, two type 10 pumping engines; Belize, British Honduras, one type 14 service truck; Belize, British Honduras, one type 75 chemical engine; Clinton, Iowa, one type 12 combination car; Flint, Mich., one type 12 combination car; Millburn, N. J., one type 40 combination car; Philadelphia, Pa., one type 31-6 truck tractor; Port Jervis, N. Y., one type 14 service truck; Pottsville, Pa., one type 75 ft. aerial truck; Syracuse, N. Y., one type 17-6 tractor.

NEWS OF THE SOCIETIES

(*Continued from page 357*)

Central-Station Load," by E. J. Bartleft, Cleveland, Baker R & L Co.

The Electric Vehicle Section will hold sessions on Tuesday and Wednesday afternoons, at which the following committees will report: Federal and municipal transportation (James H. McGraw, New York); garage and rates (C. H. Miles, Edison Electric Illuminating Co. of Boston); legislation (C. A. Freeman, Chicago, Walker Vehicle Co.); manufacturers and central station co-operation (George B. Foster, Chicago, Commonwealth Edison Co.); standardization (E. R. Whitney, Philadelphia, Commercial Truck Co. of America); transportation engineering (F. M. Feiker, New York). The following papers will be read: "The Recent and Future Status of the Electric Vehicle," Rodney H. Merrick, Philadelphia, Commercial Truck Co.; "A Message from Electrical Vehicle Users," George B. Foster, Chicago, Commonwealth Edison Co.; "The Proper Application of the Electric Vehicle," F. F. Sampson, New York, Exide Battery Depots.

The Technical Hydroelectrical Section will hold three sessions, at which the following committees will report: Prime movers (N. A. Carle, Newark, Public Service Electric Co.); underground construction and electrolysis (E. B. Meyer, Newark, Public Service Electric Co.); overhead lines and inductive interference (A. E. Silver, New York, Electric Bond & Share Co.); electrical apparatus (R. F. Schuchardt, Chicago, Commonwealth Edison Co.); meters (F. V. Magalhaes, New York Edison Co.).

Conference of Weights and Measures Officials.

Weights and measures officials of the United States will meet in annual conference at the National Bureau of Standards, Washington, D. C., for four days—May 21-24, inclusive—according to a decision of the executive committee of that association, which has power to determine the date and arrange the program. Tentative plans have been completed and invitations to send representatives have been extended to the governors of the several States and the Commissioners of the District of Columbia. Due to the demands incident to the war upon the weights and measures officials, especially those of the Bureau of Standards, some of whom are officers of the association, no annual conference has been held since 1916. This has caused much important business to accumulate, which, with the discussion of new conditions arising as a result of the war, promises to make the conference this year one of the busiest and most interesting ever held.

The objects of these conferences are to bring an exchange of views between the men who are engaged in the important task of inspecting weighing and measuring apparatus and to secure greater efficiency and uniformity in the work. When it is remembered that each State legislates independently on the subject of weights and measures laws it will be readily seen that there will be a lack of uniformity. This condition did exist very largely before the formation of the association, and one of the first things done was to endeavor to correct it. A model for a uniform State law as well as one for a city and county law and a uniform table for tolerances on weighing and measuring apparatus were drafted. These have been widely adopted throughout the country and as a consequence much has been accomplished toward eliminating the chaotic con-

ditions relating to nonuniformity in weights and measures laws.

The first conference was held in January, 1905, at which time there were present, in addition to officials of the Bureau of Standards, representatives from eight States and the District of Columbia. This number has steadily increased from year to year up to the last conference, when the representation numbered 83, comprising delegates from 21 States, the District of Columbia, Porto Rico, and the Philippine Islands. In addition 57 visitors, representing all of the large railroads of the country and numerous manufacturing concerns having weights and measures problems to solve were present, attesting to the important position the association has attained as a national organization.

The officers are: Dr. S. W. Stratton, Director of the Bureau of Standards, president; W. L. Waldron, State Superintendent, New Jersey, vice president; F. G. Barnard, sealer, Michigan, treasurer; and Maj. L. A. Fischer, chief of the weights and measures section of the Bureau of Standards, secretary. These, in addition to the following, compose the executive committee: J. G. Farrel, New York; G. E Carpenter, Vermont; C. G. Johnson, California; L. S. Schoenthal, District of Columbia; T. F. Egan, Connecticut; J. M. Mote, Ohio; F. G. Tighe, New York City; W. F. Cluett, Illinois; E. C. Lytton, Iowa; J. R. Smith, Tennessee; O. N. Creswell, Arizona; I. M. Howell, State of Washington; and Thure Hansen, Massachusetts.

United States Good Roads Association.

A large attendance of representatives of automobile clubs, chambers of commerce and good roads associations was present at the meeting of the United States Good Roads Association held at Mineral Wells, Tex., April 14 to 19. The meeting of the Bankhead National Highway Association was held at the same time.

Among the features of the meeting were the spirited fight between Oklahoma and Texas for the Bankhead highway route (which Texas won), and the organization of the Texas $75,000,000 club to agitate for the adoption of a constitutional amendment for a $75,000,000 good roads bond issue.

Among the speakers were Senator Bankhead, former governor George W. Donaghey, of Arkansas, who said that he was elected because he knew how to mix concrete; governor Larrazola, of New Mexico, governor Pleasant, of Louisiana, and governor Brough, of Arkansas.

George A. Duren, state highway engineer of Texas, in making a plea for highway improvement, said: "A road and bridge tax of 15c. on $100 is not sufficient to maintain a road under present conditions. One-half cent. per ton mile is approximately one-third the cost of a gravel road under light traffic. Some counties have voted an additional 15c. maintenance tax; 30c. per $100 valuation is barely sufficient under the traffic conditions of Texas to maintain a road without providing one cent for construction or reconstruction.

"The use of a highway having a continuous use of more than 45 vehicles per day is an economic sin except when paved with a hard surface of such width as may be required by the intensity of traffic. Intercounty roads, state highways and national highways are highways that will greatly exceed in average traffic 45 vehicles per day. State and federal aid should not be used except in aiding construction of hard surface paved highways. Gravel should be used only for private drives and local county traffic."

Resolutions were adopted asking that highway authorities throughout the country give preference to discharged soldiers and sailors. Other resolutions adopted favored the creation of a Federal system of interstate highways operated by a Federal commission; advocated higher pay for highway engineers; highway engineering courses in State Universities and A. & M. Colleges, and favored renewed efforts to rush completion of the Bankhead Highway.

J. A. Rountree of Birmingham was re-elected secretary of the Bankhead Highway Association and director general of the United States Good Roads Association. L. G. Jones of Talladega, Ala., was elected treasurer of the Bankhead Association and W. W. Heaton of Tallapoosa, Ga., director at large.

Following are the officers elected for the United States Good Roads Convention: Senator John H. Bankhead, Alabama, president; Governor Charles H. Brough, Alabama, first vice president, and Governor O. A. Larrazola, of New Mexico, second vice president. The 1920 Convention will be held at Hot Springs.

PERSONALS

Daniels, Francis E., formerly captain in the Sanitary Corps, and camp sanitary engineer of Camp Lee, Va., has received his discharge from the army and has returned to the engineering division of the Pennsylvania state department of health at Harrisburg.

Knott, Virgil P., associate professor of civil engineering, Arkansas State University, has been appointed highway engineer, succeeding Hugh Carter, resigned.

Lea, S. H., who has been engaged in construction work for the Government at the Langley Aviation Field, is now appointed for Mineral County, West Virginia, with headquarters at Keyser.

Petty, William E., who was chief draftsman for Division No. 3, New York State Highway Department, until he was assigned to build the roads in Camp Eustis, Virginia, has been appointed confidential agent for the highway department, with office at Albany, N. Y.

Stamps, J. A., chief engineer of the Atlanta waterworks, died recently. He had been connected with the waterworks department for the past 36 years.

Thomas, Roy, previously engineer of Gila County, has been appointed city engineer of Miami, Ariz., and will be in charge of flood-control work.

Tyler, Major Max C., Corps of Engineers, U. S. A., has been assigned to duty in charge of the District of Columbia water supply system, the reclamation of the Anacostia River and the improvement of the Potomac River, succeeding Col. W. L. Fisk, U. S. A., retired.

Following the appointment of Capt. F. S. Greene as state highway commissioner of New York, the main office force has been reorganized as follows: First deputy commissioner, Paul Schultze, of Albany, succeeding H. Eltinge Breed; second deputy commissioner, Irving V. A. Huie, of New York City, succeeding F. W. Sarr; third deputy commissioner, Charles Van Amburgh, of Broome county, succeeding Benjamin Rice, and secretary of the commission, Royal K. Fuller succeeding Irving J. Morris.

Mr. Schultze, the new first deputy, has had wide experience in highway construction and was second deputy commissioner from 1913 to 1915. Upon graduation from the Rensselaer Polytechnic Institute in 1891, he entered the New York State Engineer's department as assistant engineer in charge of bridges and roads, remaining until 1900. From 1900 to 1908 he was city engineer and superintendent of public works in the city of Utica, N. Y.; from 1908 to 1912, county superintendent of highways of Oneida county; from 1912 to 1913, city engineer of Troy, N. Y. Since 1915 he has been a consulting highway engineer and contractor in Albany, N. Y., and during the war was superintendent of roads at the Jacksonville Powder Works in Tennessee, and built the roads at the du Pont Powder Works at Carney's Point and Deepwater, N. J. As first deputy he will have charge of all new highway construction work of the department.

Mr. Huie, who will be second deputy in charge of maintenance, is a graduate in civil engineering at New York University, 1911. Upon graduation he entered the office of F. A. Molitor, consulting engineer, New York City, where he remained until 1916. Early in the war he was commissioned first lieutenant of engineers, and during the war he was advanced to the rank of major of engineers.

Mr. Van Amburgh, the third deputy, who will have supervision of all work on town highways, has been county engineer of Broome County.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Injury of Patient in City Hospital—Negligence of Nurse—Liability.

(Ky.) In the performance of public or governmental duties, a municipal corporation is not liable for negligent acts of its employés.—Browder v. City of Henderson, 207 S. W. 479.

(Ky.) Where a patient in a city hospital was scalded by a nurse's negligence, the city maintaining the hospital under the power given it by Ky. St. § 3290, cl. 4, as a governmental function, was not liable for the injury.—Id.

That some of the patients in a hospital maintained by a city, under Ky. St. §3290, cl. 4, are pay patients, does not make the city liable for injuries to a patient therein.—Id.

Town Hog Pound Near Residence.

(Miss.) It was wrongful and negligent for defendant town to build a hog pound about 12 feet from plaintiff's residence and against her protest, upon property of the city, and actionable negligence to fail to remove a hog from the pound after notice of its death.—Crawford v. Town of D'Lo, 80 So. 377.

Storm Sewer Damage to Merchandise—Negligence of Merchant.

(Wash.) Where city was negligent in maintaining inadequate storm sewers, and merchant was negligent in permitting backwater trap to become clogged, with result that stock of goods was damaged, the storekeeper could not recover from the city.—F. W. Woolworth Co. v. City of Seattle, 177 P. 664.

In merchant's action against city for damage to stock of goods by storm backwater, evidence held to show that the damage was caused by a defective backwater valve under plaintiff's control, so that the city was not liable.—Id.

Speed Limits for Fire Apparatus—Responsibility of Commissioner.

(N.Y.) Under Great New York Charter, §748, and in view of Code of Ordinances, c. 24, art. 2, § 17, subd. 6, officers and men of the fire department are not exempt from speed ordinances, unless they are proceeding to a fire or responding for emergency work.—Dowler v. Johnson, 121 N. E. 487, 225 N. Y. 39.

The fire commissioner of a city may be responsible for the negligent driving of his automobile by a fireman assigned to that duty, where the commissioner was present and, though the driver was subject to his orders, permitted the speed to be maintained after reasonable opportunity for protest.—Id.

Street Improvements—Irregular Assessments.

(Okla.) Proceedings of a municipal corporation ordering street improvements and assessments are presumed to be regular, and the burden is upon one attacking the legality of an assessment to show irregularity in such proceeding.—Newman v. Warner-Quinlan Asphalt Co., 177 P. 375.

Use of Railroad Crossing—Public Easement.

(Ga.) Although for more than 20 years a crossing over its tracks is used by persons and vehicles, the public will not acquire an easement by prescription, unless the use has been adverse, exclusive, and under a claim of right and not by railroad's permission.—City of Atlanta v. Georgia R. & Banking Co., 98 S. E. 83.

Continuous Use of Street—Public Highway.

(Mass.) Continuous use of street by public, even with implied assent of abutters and their predecessor or predecessors in title, is evidence of the exercise of adverse rights by the public.—Sullivan v. City of Worcester, 121 N. E. 788.

Admissions of a city or town, by making repairs or using a highway for municipal improvements, as by laying water pipes, constructing a sewer, installing and maintaining an electric light, etc., are evidence of its existence as a public highway.—Id.

Compelling Track Removal When Franchise Expires.

(U.S.Sup.) A city may compel a street railway company to remove its tracks from streets, its franchises for which have expired.—Detroit United Ry. Co. v. City of Detroit, 39 S. Ct. 151.

Power of City to Encourage Factories.—Exemption from Taxation.

(Miss.) The Legislature can confer upon towns and cities by general laws the power to encourage the establishment of factories within their corporate limits.—Robertson v. Southern Paper Co., 80 So. 384.

A city had no power, under Laws 1912, c. 115, to pass an ordinance exempting a paper company from municipal taxation for 10 years, if it would allow the corporate limits to be extended so as to include its plant, where its factory had already been established, in view of Const. 1890, § 192, authorizing exemption from municipal taxation of industries to be established.—Id.

Vacation of Street.—Review of Ordinances by Court.—Wording.—Private Bridge on Public Street.

(Ill.) A city council will not be permitted to do indirectly what it cannot do directly, and the mere use of the words, "it is deemed advisable and beneficial," in an ordinance, will not prevent the courts from looking to the substance.—People v. Corn Products Refining Co., 121 N. E. 574.

Courts have no power to review ordinances of a city council which involve only the question of motives actuating the exercise of legislative discretion, except in cases where there is such an abuse of that discretion that it may be said to be no exercise of discretion at all.—Id.

A city council has no power to authorize the construction of a bridge over a public street solely for private use.—Id.

A city council cannot vacate a street to serve a purely private use, no matter how patriotic the motive or how lawful the council believes the vacation to be.—Id.

Although the motive of a city council in vacating a street cannot be inquired into, the courts can inquire into the purpose of the vacation and receive parol evidence to that end.—Id.

Necessity and Reasonableness of Ordinances.—Suppressing Indecency.—Personal Liberty.

(Mo.App.) Municipal corporations are prima facie the sole judges of the necessities of their ordinances, and the courts will not ordinarily review the reasonableness of such ordinances when passed in compliance with authority given by the state, but should declare an ordinance void if on inspection it appears to be unreasonable.—City of Lancaster v. Reed, 207 S. W. 868.

Notwithstanding R. S. 1909, §§ 9371, 9572, authorizing cities of fourth class to enact ordinances not repugnant to Constitution and laws and to suppress public indecencies an ordinance declaring the association of two or more persons of opposite sex upon streets, one of them being a person of ill repute, to be a misdemeanor was unreasonable and void, as infringing the rights of personal liberty.—Id.

Power to Remove Unsafe Buildings.

(Tex.Civ.App.) Where buildings of plaintiffs, landlord and tenant, were so dilapidated as to render them menace to public safety in their tendency to promote fires, and therefore were a public nuisance, city under ordinance could lawfully remove them, after due notice to and hearing of plaintiffs.—Defferari v. City of Galveston, 208 S. W. 188.

City ordinances, empowering mayor and other officials on due notice and hearing to remove buildings within fire limits of city which are in such condition of dilapidation as to be nuisance in tendency to promote fires, are valid.—Id.

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI NEW YORK, MAY 24, 1919 No. 21

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9691
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Editorial Notes 361
Public Ownership of Public Utilities—Our Backwardness in Road Improvement.

Operation of Louisville Filter Plant (Illustrated)..... 362
This plant removed about twenty-one tons of mud a day from thirty-two million gallons, and 99.4 per cent of the bacteria. The details of operation and changes in the plant are described.

Sewage Treatment at Bridgeport..... 363
Original plans for Imhoff tanks were changed to others for fine screens, for reasons described by the city engineer, **James A. McElroy.**

Pennsylvania Traction Engine Regulations..... 364

Acid Treatment of Sewage..... 365
Discussion of advantages and disadvantages by E. S. Dorr, R. S. Weston and H. W. Clark.

County Highway Data..... 366
Tables supplementary to those in the April 19th issue.

Unusual Concrete Highway Bridge (Illustrated)..... 368
Description by the engineer in charge, **C. S. Bennett.**

Street Lighting in Austin..... 368

Metering Private Sprinkler Systems (Illustrated)..... 369
Construction details described by the secretary of the Lancaster water department, **John T. Brainard.**

The Columbus Reduction Plant..... 369

Ownership or Control of Utilities..... 370
Discussion by Albert E. Winchester of the advantages and disadvantages.

The Week's News..... 371

Legal News—Notes of Recent Decisions..... 375

News of the Societies..... 376

Problems Cities Are Studying with Experts..... 376

New Appliances (Illustrated)..... 377

Industrial News 377

Contract News 19

PUBLIC OWNERSHIP OF PUBLIC UTILITIES.

Recent happenings promise to give a fresh impulse to the idea of public ownership of public utilities. During the past twenty-five years experience in both public ownership and public control has been accumulating, but even yet it is questionable whether decisions of municipalities in the matter are always made wisely or even on any basis of practical reasoning but are not rather governed by impulse and prejudice untempered by judgment based on experience. "The company is overcharging us for rotten service; let's have our own plant and put them out of business" is too often the deciding argument.

Municipal ownership can be made highly successful—Municipal Journal and Public Works has described several such cases. But it can also be a rank failure. In some instances either public or private ownership could succeed with half-way efficient management; in others, only the most highly efficient management could make the plant a success. And public ownership labors under some handicaps that private does not, handicaps that may more than offset the chief advantage of public ownership—that it does not have to pay dividends, but only a low rate of interest on bonds.

To those cities which are considering which to adopt, public or private ownership, we recommend perusal of the ideas of one who has for more than twenty years managed one of the most successful municipal plants in the country, which ideas are given elsewhere in this issue.

BACKWARDNESS IN ROAD IMPROVEMENT.

When we read of the hundreds of millions of dollars that we are spending this year, or are preparing to spend, on road improvement, we are inclined to complacently smile and pat ourselves on the back as the greatest road builders of the ages. In gross amount to be spent (perhaps), we may be; but:

We have in the United States 2½ million miles of highway. France, with 65,000 miles of national highway to maintain, has a fund of $152,000,000. England, with 151,000 miles, has about $100,000,000 available this year. Our hard-surfaced roads total only one-tenth as great a length as those of France. We must spend $100,000,000 a year for twelve or thirteen years on road improvement (in addition to maintenance) in order to be able to serve directly 46 per cent of all the counties of the United States, with an additional 41 per cent adjacent to these routes.

We have been talking big figures, but how much work is really under way? Until we are actually at work on a billion dollars' worth of road improvement, we will not be in a position to feel greatly puffed up over the matter.

OPERATION OF LOUISVILLE FILTER PLANT

Removal of Bacteria and Suspended Matter, Amount and Cost of Chemicals Used, and Total Cost of Purification—Cleaning Sedimentation Reservoir—Brass Holding-down Screens in Filters Removed.

The water supply of Louisville, Ky., is furnished by the Louisville Water Company, the stock of which is owned by the city of Louisville, the works being operated by a municipal board of waterworks. Water is obtained from the Ohio river and pumped to a filtration plant on Crescent Hill.

These filters operated very satisfactorily during the year 1918, the average bacterial removal being 99.4 per cent and the suspended matter being totally removed. A total of 7,623 tons of mud were removed, an average of 20.9 tons a day or 1,286 pounds per million gallons of water. Although the average turbidity was 12 per cent less than in 1917, the total amount of water filtered was 12½ per cent greater and the cost of chemicals was increased by the same amount, being $31,417. An examination made during the year of the brass screens between the sand and the gravel in the old filters, the purpose of which was to prevent the lifting of the gravel during the washing of the filters, showed that these screens had corroded through to a considerable extent and were in such condition that they were no longer of much service in performing the duty for which they were intended. Consequently the chief engineer and superintendent, James B. Wilson, decided to remove the screens and abandon their use altogether. To prevent the lifting of the gravel by the wash water, it was decided to increase the thickness of the gravel by four inches, and maintain the same thickness of sand above the gravel. In addition to this, it was found necessary to replace all the old strainer-plate bolts and repaint the exposed metal work. It was estimated that the cost of this would be about $700 for each filter.

The coagulating basins were cleaned in April and again in October, as has been the practice since the plant was put in operation. About 15,500 cubic yards of mud were washed out by fire hose and discharged on to low ground at the pumping station at the river. The north sedimentation reservoir also was cleaned during June and July, the mud in the bottom being found to be 24 inches thick over the entire basin, which had not been cleaned for three years. As the bottom of this reservoir is level and there are only two diagonal waterways through it, the cleaning was difficult and expensive, especially since common labor was scarce even at 45 cents per hour. To aid in removing the mud, a three-drum hoisting engine was rigged upon a movable platform on one side of the walk along the top of the embankment and to this was reeved an endless cable leading to the other side of the basin. To this cable was fastened a wooden V-shaped drag, which was run backward and forward across the floor of the reservoir, scraping the mud to the open waterways, where it was washed out by fire hose into a sewer. Meantime, six or eight 1½-inch streams were kept washing the mud to the gutters, the water being furnished by a motor-driven centrifugal pump located in the gate house and giving a nozzle pressure of about eighty pounds. With this pressure the mud was broken up and carried in a semi-liquid state by the drag to the gutters. The amount of solid mud so removed was 21,00 cubic yards. After it had all been removed, the walls and bottom of the entire basin were patched and the cracks around the stones pointed up. The labor cost of this work was $3,547.

The Board of Waterworks is continuing its improvements of the property around the filter plant and pumping stations by the planting of trees, shrubs and flowers, and intends to build at Crescent Hill a swimming pool 300 feet long and 150 feet wide, in the park which has been created on its property at this point.

The total amount of water filtered was 11,857,589,199 gallons, of which 245,566,500 gallons, or 2.07 per cent, was used for washing the filters. The rate of filtration for the old filters averaged 142,800,000 gallons per acre per day, and the new filters 142,400,000 gallons.

In purifying this amount of water there were used 1,441,100 pounds of sulphate of alumina, or 0.85 grains per gallon of water; 9,805 pounds of hypochlorite, or 7.84 pounds per million gallons treated, and 17,030 pounds of liquid chlorine, or 1.72 pounds per million gallons. No copper sulphate was used last year.

The chemicals cost: For sulphate of alumina, $21,-291.90, or $1.857 per million gallons treated; for hypochlorite, $289.57, or 23.5 cents per million gallons treated; for liquid chlorine, $2,690.07, or 26.4 cents per million gallons treated; and for all chemicals, $24,271.54, or $2.08 per million gallons filtered.

The alkalinity of the river water averaged 53 for the year, varying from 34 in March to 77 in December; that of the filtered water averaged 47, varying from 22 in March to 65 in December. The bacteria per c.c. in the river water averaged 10,895, varying from 878 in August to 36,070 in February; those in the filtered water averaged 67, varying from 7 in April to 173 in October. The turbidity of the river water varied from 17 in October to 675 in February; that of the filtered water was uniformly zero. The amount of aluminum sulphate used varied from 0.54 grains per gallon in October to 1.49 in February; following the fluctuations in turbidity in a general way, but not uniformly.

The treatment reduced the free ammonia from 0.223 parts per million to 0.171, or 23.3 per cent; the albuminoid ammonia from 0.448 p.p.m. to 0.253, or 43.5 per cent; the oxygen consumed from 4.14 to 1.36, or 67 per cent. The total hardness remained practically the same, but 6 parts of temporary hardness were changed to permanent hardness.

The B. Coli averaged 2,093 per 100 c.c. in the river water and 3 in the filtered water. The reservoirs removed 56.2 per cent of the bacteria, the coagulating basins 41.3 per cent (94.3 per cent of those entering the basins), and the filters 1.9 per cent (76 per cent of those remaining in the water applied to the filters); the total removal being 99.4 per cent.

Of the suspended matter, 41.5 per cent, or 3,160 tons, was removed by the reservoirs; 49.5 per cent, or 3,780 tons, by the coagulating basin, and 9.0 per cent, or 683 tons, by the filters.

The total cost of filter operation was $50,171, or $4.234 per million gallons. This average comprised 39 cents for superintendent and laboratory payroll; 82 cents for filter operators' payroll; $2.05 for chemicals; 20 cents for wash water; 52 cents for heat, light and power; 8.2 cents for supplies; 7.5 cents for repairs, and 9.7 cents for incidentals. The cost per million gallons, averaged by months, varied from $3.23 in August to $6.09 in March; the heavy expenditures for supplies

and repairs in the latter month being chiefly responsible for the high rate.

The income of the water company for the year was $820,537, an increase of $43,521 over that of 1917. The expenses were $344,672, or $70,530 greater than in 1917. The company has no floating debt except $20,133 of meter deposits, and on Dec. 31st last had on hand $743,908 in cash, bonds, etc. During the year it reduced its bonded indebtedness by $404,000, and paid the city out of its reserve fund a $191,265 dividend, and expects to pay a similar amount this year. It also furnishes free to the city water valued at $150,000 a year. Of its total income, $31,410 was interest on it bank deposits and bonds owned, and $2,813 was real estate rents, and $781,382 was from water rents. Of the operating expenses, $125,796 was pumping station expenses; $47,838 was filter expenses; $26,287 was in connection with the distribution system; $68,529 was administrative. Including $43,931 interest on bonds, the total expenditure was $388,603; leaving the net earnings $431,934.

SEWAGE TREATMENT AT BRIDGEPORT.

History of the Studies of the Problem—Imhoff Tanks First Proposed—Fine Screens Finally Adopted and Under Construction.

By JAMES A. McELROY*

The city of Bridgeport, Connecticut, for years past having enjoyed remarkable growth in population, has, as one result of this growth, suffered from harbor pollution caused by the discharge of sewage, with the resultant nuisance and the destruction of its fishing industries The problem of sewage treatment has demanded and has received most thorough consideration, investigation, and study.

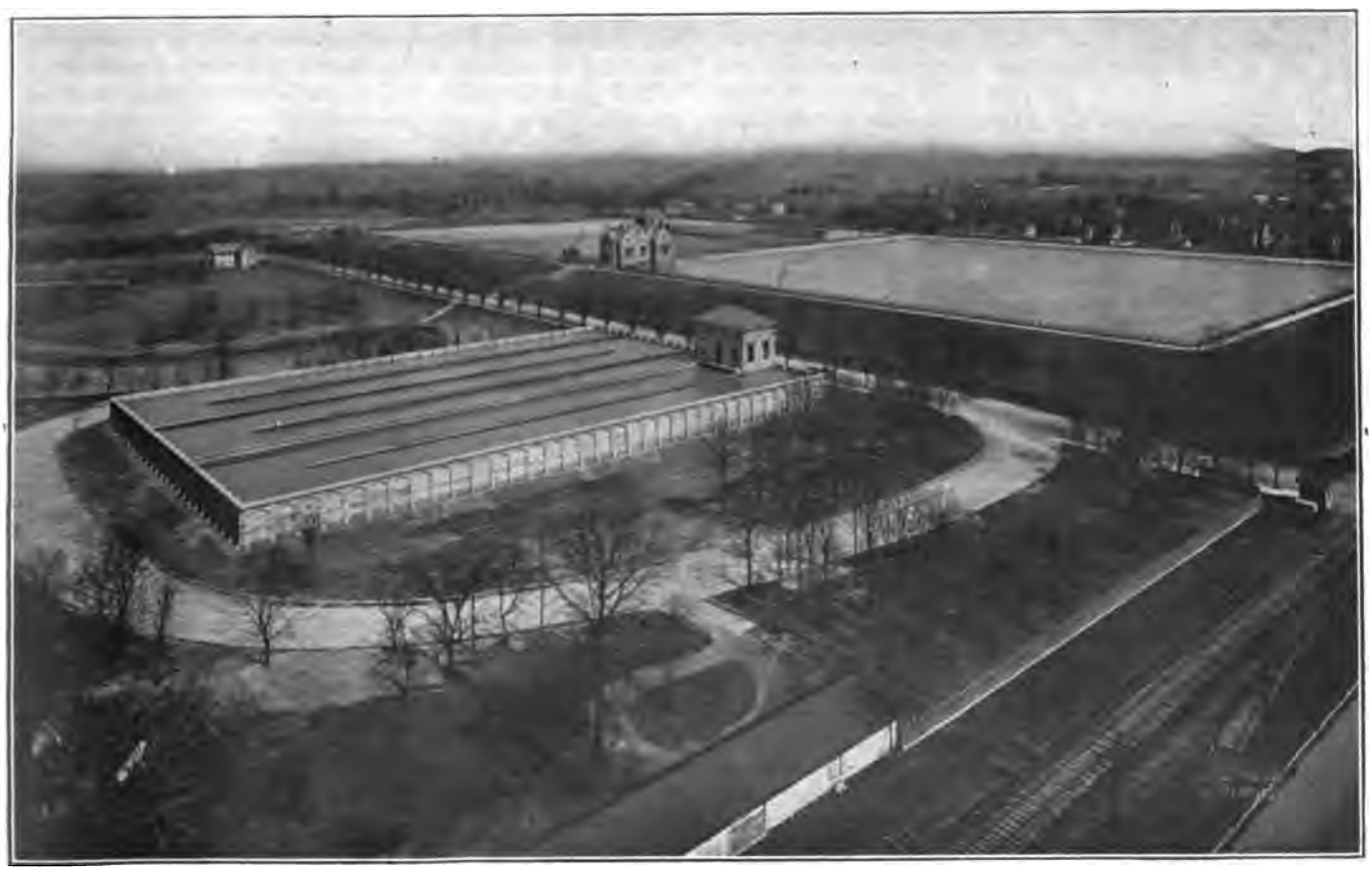
In 1908 plans for a comprehensive system of sewers intended ultimately to include sewage treatment were prepared by Hering and Fuller. All sewers built since that time have been in accordance with their recommendations, but investigation and study of the question of sewage treatment and disposal were continued.

In 1916 the firm of Hering and Gregory submitted a supplementary report modifying somewhat the earlier report of Hering and Fuller. They considered the advisability of bringing the sewage from the entire city to one treatment plant to be located on Steeplechase Island, but rejected this scheme in favor of the plan which divided the city into two sewage districts with a complete treatment plant for each district. In accordance with this report, the city let contracts for the construction of the Railroad avenue and Bostwick avenue interceptor to the site of the Western Division pumping station.

The consulting engineers and city engineer were in favor of an Imhoff tank sewage treatment plant, similar to the one at Albany, N. Y. The design for such a plant was completed and part of the work advertised for bids, but meanwhile information obtained as to the unsatisfactory operation of several Imhoff tank installations and of the satisfactory operation of fine screens for conditions similiar to those at Bridgeport, led the city authorities to hold up the work, in order to investigate the development and efficient operation of the fine-screen method of treatment, and its extensive operation throughout the United States. The result was that it was considered advisable to review the entire subject of sewage treatment and disposal and again investigate all types of plants in actual, practical operation, so that the conclusions previously reached might be confirmed, modified or rejected.

Accordingly, investigations and studies were undertaken and expert authorities sought and consulted. The entire project was restudied in the light of the latest practice and operating results. These investigations

*City Engineer of Bridgeport, Conn.



LOUISVILLE SEDIMENTATION TANKS, COAGULATION BASIN AND FILTERS.

were conducted by the Paving and Sewer Commission, the Department of Public Works, the City Health Board, and by the City Engineer. The subject was thoroughly considered by each of the departments having distinct connection with and interest in the economic and practical solution of the problem. Following the conclusions of the commissioners and officials, it was determined to secure the advice of the most expert engineers obtainable. For this purpose, Geo. W. Fuller of New York City, and Geo. A. Johnson (now Lt. Colonel in the U. S. Army), were called into consultation. These gentlemen made a thorough review of all previous findings and determinations, and undertook a new and separate investigation of the harbor waters and local conditions, particularly as pertaining to and affecting the western part of the city. It was ultimately determined, as a result of all foregoing investigations and studies, including those of the health authorities of both city and state, to adopt the fine screen method as the most reasonable and appropriate system of sewage treatment for Bridgeport.

The questions and data that had to be considered in reaching the conclusion that a fine screen plant was the best for this city were of much interest. The proposed Imhoff tank treatment plant plan had provided for an elaborately designed bar screen and grit chamber for the mechanical protection of the pumping machinery and the Imhoff tanks. Notwithstanding this preliminary treatment by bar screens and grit chambers, it was observed that several Imhoff tank plants in operation, of the latest construction and designed by some of the most eminent authorities, were unsatisfactory in operation and little better than failures, particularly from scum troubles, tank frothing, failure of sludge digestion, chamber fouling, overflowing, etc., these tanks often creating decided local nuisances.

Some important questions had to be considered as to the increase in size of Imhoff tanks, necessitated by the lack of working capacity as revealed by the latest plants designed and in service. The evidence showed that many of the recent plants were unable to handle more than fifty per cent of their estimated or figured capacity and few plants more than 60 per cent to 70 per cent, thereby indicating the necessity for a large increase in size; and that this would involve an increase in cost of tanks to provide the greater capacity called for by experience as required for operation and sludge digestion. Moreover, there were no really satisfactory data obtainable as to how much capacity such tanks should have in order to insure reliable operation free from nuisance. A further problem of great importance was presented by the immediate or early necessity of oxidation of the effluent upon sprinkling filters or by some other method, if tanks were used, which would involve further heavy expenditures.

It was observed that fine-screen treatment plants, extensively installed throughout the United States during the last four years, work successfully as independent sewage plants; also as auxiliaries to Imhoff tank plants, as at Rochester, N. Y., where fine screens before Imhoff tanks have made this one of the most effective plants operated in the country. Further, in consequence of the continued trouble experienced in the operations of the newly designed and constructed Imhoff tank treatment plant for the joint plant of Plainfield-Dunnellen, N. J., it was necessary at that plant to resort to the use of a fine screen installed before the Imhoff tanks, to overcome the difficulties of scum trouble in the tanks and sludge fermentation. In view of all the foregoing, it was determined to adopt the fine screen method of sewage treatment at Bridgeport.

The engineers also investigated the feasibility of several small screen stations for the district rather than one large station. This plan would reduce the cost of construction of the large sewers required to reach one treatment plant by gravity, and would also cut the cost of pumping. It was found, however, that construction of the extensive system of intercepting and collecting sewers originally planned had advanced to such an extent as to establish the point of treatment at one plant located in the southwestern part of the district. Considering the location of the plant and the method of treatment established, the only remaining problem was the design of the plant in combination with a pumping station.

With the sewage arriving at the point of treatment 22 feet below street grade, various combinations of screens and pumps were carefully planned and studied in an effort to avoid the additional expense of placing screens at a low elevation with practically all construction below tide level. Due consideration was given to the design of a plant looking to low-level pump section and high-level screen plant, from which the sewage which had been raised by the pumps would be discharged by gravity after passing the screens. There were several objectionable features to this plan, particularly the fact that pumped sewage would not submit so effectively to screen treatment as unpumped sewage. The ultimate design selected was that of fine-screen treatment at the low level of the gravity flow to the plant, and the pumping of screened effluent through a force main against the tide.

Specifications and plans were accordingly prepared, approved by the engineers, city and state health boards, by the various city departments, and by the Paving and Sewer Commission. Bids were publicly asked and received on July 10, 1918, and an award of the contract was made, subject to the approval of the necessary bond issue by the Federal Capital Issues Committee. This was duly received and the work authorized to proceed.

This plant, which is the result of a long-extended, thorough study and restudy of the problem, followed by carefully drawn conclusions, based not only on theory but also on practical operating results, is in general interesting in marking a new epoch in sewage treatment.

The general design and features of the plant will be described in a future issue.

PENNSYLVANIA TRACTION ENGINE REGULATIONS.

On May 13th representatives of the State Highway Department and manufacturers of traction engines and tractors held a conference and agreed on amendments to the traction engine bill aimed to protect the highways from destruction by traction engines. The spokesman for the manufacturers, A. B. Farquhar, of York, Pa., agreed that the manufacturers should not build engines that would damage the roads that the state is building. He said: "Personally I would rather stop manufacturing tractors than be responsible for the tearing up of the thoroughfares this state needs so badly. Your state highway department should have the authority to protect the roads, and there is no denying the fact that narrow tires and narrow cleats cut the road surface." It was finally unanimously agreed that the provisions of the traction engine bill should be amended so as to provide for the examination by the highway department of all traction equipment for which a state license shall be asked, such engines as do not conform to the regulations being denied a license. Also that there should be a penalty against the operator of any tractor engine not complying with the regulations of $25 for the first offense,

$50 for the second and $100 and imprisonment for the third. It was also agreed that the highway department and the manufacturers should jointly conduct experiments and make investigations to determine the effect of the operation of tractors bearing cleats and that if necessary, such further restrictions will be placed as may be necessary to prevent damage to improved roads from the use of cleats.

ACID TREATMENT OF SEWAGE.

Deoxygenating Effect, Comparison with Imhoff and Activated Sludge, and Other Features Discussed by E. S. Dorr, R. S. Weston and H. W. Clark.

Last October, Professor C. E. A. Winslow read before the American Society for Municipal Improvements a paper describing experiments made at New Haven with the Miles acid treatment of sewage; which paper was published in Municipal Journal for October 12, 19 and 26. The engineers most influential in bringing this method of treatment into prominence were Edgar S. Dorr and Robert Spurr Weston, both of Boston, whose experiments were referred to by Professor Winslow in his paper. These engineers presented a paper before the Boston Society of Civil Engineers which is published in the April issue of the Journal of that society, in which they give the history of the Miles acid process and the experiments that have been made upon it, crediting Professor Winslow's paper with being "an eminently fair report of the results of a thorough investigation."

One of the disadvantages of the treatment suggested by the New Haven experiments was the amount of sulphur dioxide present in the effluent and its deoxygenating effect on diluting water. Messrs. Dorr and Weston believe that, if it were thought necessary, "a sufficient degree of re-aeration could be secured by discharging the effluent over a series of riffles or, if that plan were impracticable, by pumping the effluent through a suitable aerator, in the latter case at a cost of less than one dollar per million gallons. Fish life could hardly be affected, for the only place where fish could get any considerable depth of deoxygenated water would be close to the outlet. Elsewhere they would not be affected unless they swam on the surface, which fish would not do ordinarily." However, they do not think aeration would be necessary in most cases, since the effluent would be warm and practically sterile and free from sludge-forming suspended matter but, when discharged into a considerable body of water, would rise to the surface and spread in a thin layer, where it would rapidly be reaerted by the effect of wind, currents, passing craft, etc.

Comparing this treatment with the Imhoff tank and activated sludge processes, the authors state that the sludge from the Miles process contains much less moisture than activated sludge and about the same as subsiding basin sludge and Imhoff tank sludge. The relative volumes of the several sludges containing the same amounts of dry matter, taking the amount of activated sludge as 100, would be 18 for subsiding basin sludge, 15 for Miles process sludge, and 13.6 for Imhoff tank sludge. "As compared with activated sludge, the advantage of handling less than one-seventh of the volume of activated sludge is obvious."

Concerning the cost of a plant for carrying out the Miles process, the authors state that the devices required include those for producing sulphur dioxide gas and for feeding niter cake or other forms of acid, subsiding basins, sludge-handling apparatus, sludge dryers, grease extractors, grease stills, and tankage dryers and grinders. "While the list is formidable and is enough to rule out the process for small plants, in the case of a city like Boston, however, the cost should not exceed $15,000 per million gallons daily capacity."

The authors end their paper with a number of conclusions from the various experiments and studies which have been made, these conclusions being as follows:

(1) The Miles process will produce a well disinfected effluent from which 90 per cent of the settleable solids have been removed.

(2) Whereas it requires for its accomplishment devices for the chemical treatment of the sewage and for drying and degreasing the sludge, competent supervision is necessary.

(3) On account of the nature of the plant and the relatively high cost of operation for small installations, it is not well adapted for the purification of small volumes of sewage.

(4) Its operation should cause no local nuisances.

(5) It causes the removal of over 99 per cent of the bacteria.

(6) The effluent remains stable long enough for the neutralization of the excess acid, and the oxidization of the sulphites and the sulphates by dilution.

(7) As compared with the activated sludge process, the volume of sludge is very small.

(8) Compared with the cost of the oxidation processes, the cost of installation is low; it is somewhat higher than that for Imhoff tanks with chlorination.

(9) The products recovered are valuable, and their recovery would effect a conservation of natural resources.

(10) Apparently it is the most economical process for producing so well clarified and so stable an effluent, and under present conditions it seems as if it could be installed and operated at a profit in those larger cities where the conditions are favorable.

(11) To determine the costs of sludge drying and degreasing more accurately than is possible from the available data, a large-scale experiment is urgently needed.

In the discussion of this paper, Harry W. Clark, chief chemist of the Massachusetts State Department of Health, expressed his opinion that the process could not be made a financial success, citing as his chief argument the fact that the manufacturers of Lawrence, who discharge into the Merrimac river many thousand gallons daily of very strong wool liquor which contains two hundred times as much grease to the gallon as Boston sewage and a very high percentage of potash, have not found it desirable to endeavor to recover the grease from any but the strongest liquor, but continue to discharge into the river large quantities of wool liquor containing much more fat than is found in domestic sewage. Moreover, that the plants which are treating the strongest liquor would not have been started except for the scarcity of grease due to the war.

Replying to this, Mr. Weston said: "It is a well-known fact that wool-scouring wastes can be treated with acid and practically 99 per cent of the grease removed, and all plants which have used this process during the war have been immensely profitable. I personally know this is true. But the plants in Lawrence (and I say this because we have designed one of them) are all centrifugal-machine plants; that is, plants in which the wool scouring wastes are treated by passing them, after a subsidence, through a special centrifugal machine, which does not remove over 60 per cent of the fats from the stronger wool-scouring wastes. This probably explains why the strongest wastes are used, because if one should take the weak wool-scouring wastes from certain Lawrence mills containing the effluent from the third and fourth bowls, the results would be disappointing and not profitable."

COUNTY HIGHWAY DATA.

Supplementary to Tables Published in the Issue of April 19 from Information Furnished Since Then—Work Contemplated, Wages, Results of Heavy Traffic, Bridge Failures and Pavement Guarantees.

CONTRACT WORK.

State and County.	Form of contract that is favored.	In there abundance of unskilled labor in county?	Wages paid this year.	Wages prior to 1917.
Florida:				
Orange	Straight contract.	No.	$2.50 to $3.	$2.
Indiana:				
Adams	Straight contract.	Yes.	25c.	About 17½c.
Iowa:				
Clayton	Contract, county furnishing material, or by day labor.	Yes.	30c to 40c.	25c to 30c.
Kansas:				
Sumner	Straight contract.	Plenty at present.	40c.	20c.
Kentucky:				
Woodford	Straight contract or force account conditionally.	No.	$2.50 to $3.	$1 to $2.
Michigan:				
Genesee	Straight contract; also by day labor.	No.	40c.	35c.
Missouri:				
Lawrence	On bridges, straight contract; on roads, day labor proved best.	Just about enough.	20c to 30c.	15c.
Montana:				
Madison	Personally prefer contract work, but policy of county commissioners is county force, because of owning machinery.	Nominal supply.	$3.50 to $4 for 8 hours.	$3 to $3.50.
New York:				
Chautauqua	Straight contract.	No.	$3.50.	$1.75 to $2.25.
Oswego	Day labor under competen superintendent.	Sufficient.	30c.	25c.
Oklahoma:				
Okmulgee	Contract, county furnishing material.	Yes.	40c.	30c.
South Carolina:				
Kershaw	Day labor.	No.	$45 per mo.	$20 per mo.
Texas:				
Carson	Contract work.	No.	....	....
Hansford	Straight contract, but conditions compel part of work done by day labor.	No.	$3 to $3.50.	$2 to $2.50.
Hemphill	Regular contract.	Sufficient.	$3 to $4.	$2.50 to $3.
Washington:				
Benton	Straight contract.	No.	$3.50 to $4.	$2.25 to $2.50.
West Virginia:				
Kanawha	Straight contract first, or work by county. Cost plus entirely unsatisfactory.	Yes.	$3.50.	$2.50.
Wisconsin:				
Buffalo	Straight contract for big jobs; day labor for small jobs.	No.	35c.	About 20c.
Iron	Straight contract or day labor.	No.	30c.	35c.

BRIDGE FAILURES.

State and County.	Number of bridges on county roads.	Have any broken because too light for traffic?	How many are considered unsafe for the heaviest traffic?
Florida:			
Orange	10 or 12 small ones.	No.	None yet, but some soon
Indiana:			
Adams	3 new ones.	No.	None.
Iowa:			
Clayton	500 to 600.	Yes.	50%
Kansas:			
Sumner	300 large ones.	No.	30
Kentucky:			
Woodford	.....	No.	....
Michigan:			
Genesee	2	No.	None.
Missouri:			
Lawrence	23	No.	4
Montana:			
Madison	16 over rivers, no record of small ones.	No.	9
New York:			
Chautauqua	Do not know.	No.	40%.
Oswego	500	No.	25
Oklahoma:			
Okmulgee	138	No.	None.
South Carolina:			
Kershaw	About 65.	Only flooring.	Nearly all.
Texas:			
Carson	No bridges.	....	....
Hansford	4	No.	None.
Hemphill	4	No.	....
Washington:			
Benton	6	No.	None.
West Virginia:			
Kanawha	100	No.	None.
Wisconsin:			
Buffalo	.....	No.	Older type not very strong.
Iron	14 on Federal and State aid roads.	No.	None.

PAVEMENT GUARANTEES.

State and County.	Are highway contractors required to give bonds?	Period of Guarante.	Do you consider guarantee desirable for all kinds of pavements?	If not for all, for what kinds?
Florida:				
Orange	Yes.	1 year from completion	Yes.	....
Indiana:				
Adams	Yes.	1 year.	Yes.	....
Iowa:				
Clayton	Yes, for 50% of his bid.	1 year.	No.	Concrete, brick, wood block, asphalt or bituminous surfaces.
Kansas:				
Sumner	No.	....	Depends on nature of supervision.	....
Kentucky:				
Woodford	....	....	No.	....
Michigan:				
Genesee	For asphaltic concrete.	5 years.	Yes.	....
Missouri:				
Lawrence	On bridges.	2 years	No data.	....
New York:				
Chautauqua	No.	....	No.	Brick or concrete, but with proper inspection; do not favor guarantee.
Oswego	....	....	No.	....
Oklahoma:				
Okmulgee	No.	....	No.	Rather have extra cost built into pavement.

State and County	Kinds of surface to be constructed.	Amount	Will reinforcement be used in concrete pavements?	Distance between expansion joints.
South Carolina:				
Kershaw	....	....	Yes.	All.
Texas:				
Hemphill	Yes.	Until work is accepted.	Yes.	....
West Virginia:				
Kanawha	Yes.	5 years	No.	Do not favor guarantee.

COUNTY WORK CONTEMPLATED FOR 1919.

State and County	Kinds of surface to be constructed.	Amount	Will reinforcement be used in concrete pavements?	Distance between expansion joints.
Florida:				
Orange	$100,000 brick roads, $25,000 clay surfacing.	$125,000	No concrete.	....
Indiana:				
Adams	45 mi. macadam.	Average, $5,800 per mi.	No.	....
Iowa:				
Clayton	Most heavy grading, about $12,000, and 3 mi. gravel surface.	.....	Not yet.	....
Kansas:				
Sumner	Concrete	8.5 mi. 18 ft.	Some places.	33⅓ ft. when used.
Kentucky:				
Woodford	15 mi. reconstruction macadam, 20 mi. surface treatment, 4 small concrete bridges and maintenance.	35 mi.	....	....
Michigan:				
Genesee	30 mi. 9-ft. gravel roads, 12 mi. concrete and asphaltic concrete pavements.	42 mi.	Yes.	50 ft.
Missouri:				
Lawrence	About 30 mi. gravel hard surface roads, and regrade about 60 mi.	90 mi.	No concrete.	....
Montana:				
Madison	24 mi. grading and crushed stone surfacing, 150 mi. grading, and nominal maintenance.	24 mi. (Fed. Aid)	No concrete.	....
New York:				
Chautauqua	35 mi. macadam by county. 27 mi. concrete by state.	62 mi.	On some roads.	30 ft.
Oswego	....	$200,000	No.	30 ft.
North Carolina:				
Mitchell	$45,000 state aid, $11,000 county funds.	$56,000	....	....
Oklahoma:				
Okmulgee	3 mi. brick, 3 mi. asphaltic concrete and 2 mi. concrete.	8 mi.	No.	25 ft.
South Carolina:				
Kershaw	Repairing 10 mi. sand-clay and 150 mi. dirt road.	160 mi.	....	....
Texas:				
Carson	About 120 mi. grading.	$10,000	Only dirt roads.	....
Hansford	Dirt road graded.	20 mi.	No.	....
Hemphill	Grading and concrete culverts.	45 mi.	....	....
Washington:				
Benton	10 mi. gravel surfacing, 10 mi. gravel resurfacing.	20 mi.	No concrete.	....
West Virginia:				
Kanawha	....	$500,000 to $1,000,000	No.	End day's run.
Wisconsin:				
Buffalo	Grading and draining.	About $40,000	No pavements to be laid.	....
Iron	$40,000 grading, $20,000 gravel surface.	$60,000	No concrete roads	....

RESULTS OF HEAVY TRAFFIC.

State and County	Greatest weight of combined load and truck using highways.	Legal limit of weight.	Have any roads been damaged by heavy trucks?	What changes have been made in road construction because of heavy trucks?	Are such changes contemplated or recommended?
Florida:					
Orange	About 8 tons	None, but contemplated.	Yes.	Better foundation should be provided.	Yes.
Indiana:					
Adams	5-ton trucks	None, except when roads are soft.	Yes.	None.	Yes.
Iowa:					
Clayton	8 tons	None.	Yes, one piece of waterbound macadam has gone to pieces.	Will use only concrete, brick or wood block surface.	Yes.
Kansas:					
Sumner	10 tons	....	....	....	....
Kentucky:					
Woodford	....	500 lbs. per inch for 1st 2 inches, 400 lbs. per inch after that.	Yes.	We are surface-treating.	....
Michigan:					
Genesee	15 tons	State limitation, but not much attention paid to it.	Not materially.	None.	No.
Missouri:					
Lawrence	5 tons	None that I am aware of.	Very little.	None.	Yes, sub-grade must be made heavier.
Montana:					
Madison	8 tons	None.	No more than by ordinary traffic.	None.	For hard-surfaced roads will recommend 100% better foundation than present practice.
New York:					
Chautauqua	12 tons	12 tons for state roads, 8 tons for bridges.	Not to great extent on improved roads.	More durable types for main roads, increased depth of metal on secondary roads.	...
Oswego	10 tons	None.	Yes.	None, except heavier base.	Not determined.
Oklahoma:					
Okmulgee	10 tons	None.	Yes.	Increased thickness of base.	....
South Carolina:					
Kershaw	15 tons	None.	Yes.	All our bridges have been made heavier.	....
Texas:					
Carson	....	No limit.	No.	....	....
Hansford	No heavy traffic	....	....	None.	No.
Washington:					
Benton	10 tons	5-ton load.	Not much.	Using more material.	....
West Virginia:					
Kanawha	15 tons	None.	No.	Thicker concrete base.	....
Wisconsin:					
Buffalo	About 10 tons	None that I know of.	To some extent.	None.	Yes.
Iron	7 tons	....	Yes.	From earth to gravel.	....

AN UNUSUAL CONCRETE HIGHWAY BRIDGE.

By C. S. BENNETT.

A highway bridge has been built near Greenup, Ky., having a total length of two hundred feet, which is of a type not usually employed for a structure of such length on a county highway. Results, however, seem to have justified the use of this type in this particular instance.

The bridge spans a ravine and a small creek on the state highway along the Ohio river. Funds for building a structure at this point were limited, and a careful study was made of various types of structures in order to select one which would combine utility and durability at a minimum cost. A fill with a culvert was considered, as well as several types of long-span bridges, but the state highway department finally designed and decided upon this structure, which seemed to be more economical than any other.

The bridge consists of eight spans, each twenty-two feet in the clear, supported by open bents varying in height from a maximum of 35 feet from solid rock to the under side of the floor beams to a minimum of about 29 feet, although only about 15 feet of the latter extends above the ground surface. Each span consists of four girders connected by an eight-inch floor slab combined in T-beam construction. The general design was originally prepared for single-span bridges with a loading condition equivalent to a twenty-ton road roller, but the design was readily adapted to the combination of eight such spans into this single structure, special expansion joints being introduced at alternate spans, these joints extending through the hand-rail and post as well as the floor system.

The supporting structure consisted of two abutments and seven open bents, each bent consisting of two legs tied together by a cap beam at the top and a cross beam at a point eleven and a half feet below the bottom of the cap beam. Each post or leg is of rectangular section two feet by three feet and reinforced with twenty ⅜-inch square deformed rods, with quarter-inch hooping every twelve inches. The bottom of each post was carried twelve inches into the solid rock, without the use of spread-footings, and five-foot anchor rods one inch in diameter were set two feet into the bed rock.

The cap beams were so designed that all of the girders carrying the floor had firm support. Expansion joints were provided between the floor beams and the cap beams. The cap beams are three feet by three and a half feet and are heavily reinforced. The cross beams are three feet by one and a half feet in section and reinforced with twelve ½-inch rods. The abutments were constructed of plain concrete and in form of the common U type.

As special forms had to be built for this structure, the work was carried ahead one span at a time, two sets of forms being used. The contractor was able to use the bents of the original structure in securing support for the forms for the superstructure. Owing to the unusual amount of steel used in the design, the forms were braced very thoroughly. Forms were built with a camber of one inch to allow for sag when the concrete was poured. The amount of sag was measured for each span and the maximum sag was ¾ inch.

After the completion of the concrete work, the roadway was surfaced with waterbound slag macadam on an earth cushion.

The quantities of material used in this bridge were: gravel, 620 tons; sand, 255 tons; cement, 509 bbls.; steel, 45,550 lbs.

The total cost of the finished structure was $7,420, including the surfacing of the roadway. The bridge was built by Burgess Brothers, of Scottsville, Va., under direction of the Department of Public Roads of Kentucky. The writer was resident engineer for the State.

TOWN BRANCH BRIDGE, GREENUP COUNTY, KENTUCKY.

STREET LIGHTING IN AUSTIN.

Furnishing lighting and current for light and power in Austin, Tex., are a function of the Department of Water, Light and Power of that city, which department was for ten years prior to the first of this year in charge of E. C. Bartholomew. In his report for the year 1918, Mr. Bartholomew stated that, although activities in the department were somewhat curtailed by the war, there was completed early in the year an underground conduit system which cost approximately $60,000 and required almost two years' time for its construction. In this conduit system will be placed the lead cables supplying light and power to the business district, and all other electric wires, the manholes having been made large enough to accommodate transformers and distribution boxes so that ultimately not a wire of any kind will be seen above ground in this district. To complete this proposed installation will, it is estimated, cost about $50,000, and it is recommended that the installation be made gradually, beginning in 1919, in order that the cost may be felt as lightly as possible.

Only one addition was made to the street lighting system during the year, this being the placing of 52 single-light cast-iron poles on West avenue, this being in continuation of the established policy of the department to place ornamental lights on streets as they are paved, the entire cost of such installation being paid by the department. All ornamental lighting circuits are 6.6 ampere series, and are supplied by constant-current transformers placed in weather-proof stations about the city and fed from one general 2,300 volt supply circuit. The standard equipment consists of an 8x16 opal globe and a 100 c.p. lamp, with lead-covered and steel-taped No. 8 cable laid about twelve inches in the ground just outside of the curb line. The poles are placed about 90 feet apart alternately on the two sides of the street. The 52 poles and about 8,800 feet of cable in West Avenue cost $4,000.

At the end of the year the street lighting system consisted of 665 one-light ornamental metal poles (incandescent), 18 two-light metal poles (incandescent), 66 three-light ornamental poles (incandescent), 35 one-light metal poles (luminous arcs), thirty 150-foot steel towers with from three to six alternating-current arcs on each, and 151 scattered 100 c.p. series lamps on wooden poles in the residence districts. In addition there are quite a number of lamps in the various parks of the city which are placed, maintained and operated by the department entirely at its own expense. When the full street-lighting equipment is in operation it consumes approximately 200 kilowatts.

The electrical equipment comprises four units, one being a General Electric generator coupled to an Allis-Chalmers tandem, compound, condensing engine of 300 kwh capacity; the second is an Allis-Chalmers-Parsons steam turbine of 500 kwh capacity; third, an Allis-Chalmers-Parsons steam turbine of 1,000 kwh capacity; fourth, a General Electric Curtis steam turbine of 2,000 kwh capacity. This gives a total generating capacity of 3,800 kwh. Mr. Bartholomew believes that this equipment, which is all in first-class condition, will last the city of Austin twelve or fifteen years if well maintained.

METERING PRIVATE SPRINKLER SYSTEMS.

By JOHN T. BRAINARD.*

The accompanying photograph shows the system of metering water service connections used for private sprinkler systems in the city of Lancaster, Pa. The connection is made at the city main by a Smith cut, which includes a sleeve and tapping valve the size of the service required. The Water Department runs the service in to the foundation of the building, connecting this end with a standard flanged pipe.

The by-pass connection on a 6-inch service requires two pieces of 6-inch pipe 20 inches long, one 6-inch swing check-valve weighted on the clapper with 1½ pounds of lead. The by-pass consists of one ¾-inch water meter, two ¾-inch valves and one ¾-inch gate check-valve and other fittings to make up the connection. The cost of the meter and by-pass connection, including plumber and labor, was $68.90. The cost to make the Smith cut and run the direct service into the building, including all material and labor but no excavation was $170.45. The well that houses the by-pass connection, our own patent stop cover, brick, sand, cement, etc., including bricklayer and helper, amounts to $74.55. Adding 20 per cent for overhead charges, the total cost of the service was $376.68.

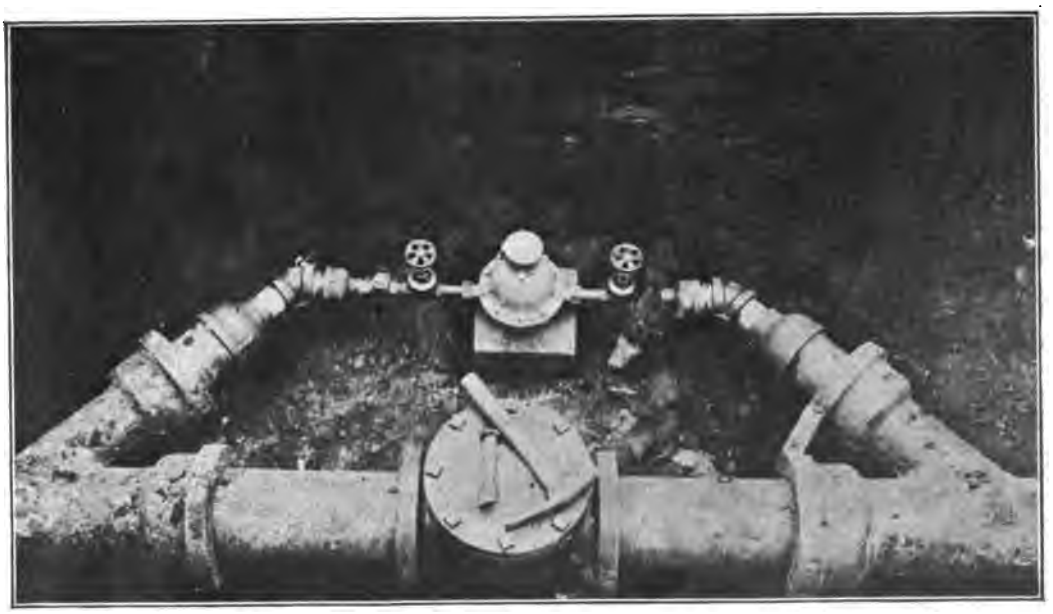
A service charge is made at the rate of $10 per year, whether or not any water passes through the by-pass meter. If more than 200,000 gallons of water is used for tank tests or drills, it is paid for at the rate of 5 cents per 1,000 gallons.

*Secretary of Lancaster, Pa., Department of Water.

We have found this system of a fire line connection to prove very satisfactory to both the consumer and the city and accepted by the Fire Underwriters' Association.

The above kind of service was given an accurate test on a 10-inch fire line connection into one of our largest manufacturing plants, a 1-inch by-pass meter being used. Upon one of our regular monthly readings of all fire line meters we noticed that this meter showed an increase in consumption, the factory was notified and they immediately got in touch with their inspector. The leak was located in the yard system. The inspector made calibration tests and found a leak of 3 gallons per minute, which was causing the 1-inch by-pass meter to register 180 cubic feet every 24 hours.

The city has installed so far 57 by-pass connections for sprinkler systems, and many of them have been tried out on fires that have occurred in the buildings with the most satisfactory results.



LAYOUT OF BY-PASS CONNECTION TO SPRINKLER SYSTEM FOR MEASURING LEAKAGE THAT DOES NOT INTERRUPT THE FLOW

THE COLUMBUS REDUCTION PLANT.

The superintendent of the muncipal reduction plant of Columbus, Ohio, Thomas D. Banks, in his report for 1918, says that "the operation of the plant was affected by abnormal conditions due to the war, the worst condition being the reduction in raw material. In addition to the loss of tonnage caused by conservation, it is apparent that a large quantity of garbage is being hauled out of the city by individuals who feed it to hogs. This is contrary to city ordinance and a campaign should be inaugurated to stop the practice. Such a campaign should be well planned and sufficient attention given to it to insure its success. The plant can handle a considerable increase in tonnage with very little additional total cost."

The amount of garbage received per month varied from a minimum of 1,058.34 tons in January to 1,694.80 in August; the daily average being 39.19 tons and 62.77 tons, respectively, with an average for the year of 49.93 tons. The population is estimated at 220,000, giving 138.44 pounds per capita for the year. The total shows a decrease of 9 per cent from that for 1917, in spite of the increase in population.

The total amount of grease produced was 676,407

pounds, or 43.28 pounds per ton of garbage, which brought $79,492.45. The tankage totaled 1,603.30 tons, or 205.16 pounds per ton of garbage, and sold for $31,-707.60. In addition, $877.55 was received for hides and $210.74 for miscellaneous items, giving the total receipts, $112,288.34.

The cost of operation was $85,620.90, this including supervision, labor, fuel, motor vehicle supplies, chemical supplies, telephone, insurance, light and power, maintenance of buildings, of railway tracks and of equipment, and all other charges except interest and depreciation and an allowance for taxes. This shows a gross profit of $26,667 to cover these fixed charges.

There were 6,427 tons of coal used, or 0.4112 tons per ton of garbage, and 9.877 k.w.h., and 1,664 gallons of gasoline per ton of garbage.

An average of the analyses of the tankage throughout the year was as follows: Moisture, 3.39 per cent; ammonia, 3.77 per cent; potash, 1.08 per cent; B. P. L., 7.94 per cent. The grease analyses average: Moisture, 1.96 per cent; impurities, 0.55 per cent; unsaponifiable, 4.57 per cent.

OWNERSHIP OR CONTROL OF UTILITIES.

Advantages and Disadvantages of Each Discussed by One Who Has Had Twenty-two Years Experience as Head of a Municipal Plant.

"Public ownership of public-serving utilities is truly a splendid ideal. Theoretically it stands high on the side of right. And by the same token, conditions must be first made right for it, or it cannot stand."

The above is quoted from a letter written by one who has, perhaps, occupied the most prominent place in municipal ownership during the past twenty years—Albert E. Winchester. Mr. Winchester has for twenty-two years been general superintendent of the South Norwalk (Connecticut) electric works, and was a member of a commission appointed by the National Civic Federation in 1905 to investigate the subject of municipal ownership. The South Norwalk plant, which was designed by him as well as having been in his charge during its entire existence, has paid, out of the profits from its commercial business, the entire cost of construction, including interest and capital of the original bond issue, has furnished light and power service to the municipality without any profit, presented the city with the street-lighting system described in Municipal Journal and Public Works a few weeks ago, has loaned money to the municipality without interest, and now has a reserve fund of nearly $16,000 and not a cent of debt, and is possessed of a plant representing an investment of over $225,000. While attaining this favorable financial condition, its rates having always been and are, it is said, the lowest in that part of the country, and are only about two-thirds high as those previously paid to a private company.

Reading the above, it would be natural to assume that Mr. Winchester is a strong advocate of municipal ownership. As a matter of fact, however, this cannot be said to be the case. He is neither an advocate nor an opponent, and the fact that, in spite of his long and most favorable experience, he sees the disadvantages as well as advantages of such ownership, would seem to give his opinions on the subject the greatest weight. Continuing the quotation given above, he writes:

"Public ownership has done well in Europe; but the variedly more or less centralized scheme of control and supervision in those countries is in contrast to our American ways. We are not so careful here to make the fact effective that there is only one way to do business successfully and well. We are the most competent people in the world to promote and carry on big affairs under private management and capitalization, but when it comes to the long test of enduring publicly owned and operated commercialized industrial and utility undertakings, we find ourselves wanting in some capacity that is hard to point out. We do not lack patriotism; our civic pride is on a par with the best; but we do not educate men to do public and civic work with the same purpose and determination to win as we do for private service. We appoint, but seldom select, men for public duty. Appointees are not considered from the standpoint of experience and fitness for good business and success, but too often for political desirability and party victory for the time being. That sort of thing is fatal to any good thing of constant requirement, and it is a wonder that we are not less successful than we are in handling our public affairs. Perhaps the reason is that we have no contrasting comparison between how our public affairs would be managed under enduring methods as employed in the conduct of our great privately owned industries. We can thank God that we are Americans and we can love American ways of doing things, for they are by a long measure better as a whole than the ways of others. But, good as they are, our American ways are rather too undeveloped as yet in some parts for us to run chances with them. We must have a care and not feel too sure that, because we are so capable in most pursuits, we are able to do anything without preparation.

"As for public ownership, our government has shown us what it could do under a condition of the greatest unified support and sympathy that it could be given. We all stood with it to a man, it had all the power that could be concentrated in it and was financed without stint to the limits of our wealth. And what have we today? Consider this from the point of good service, public and commercial progress and economy, public comfort and necessity, and see how it compares with other times when our government controlled but did not attempt to manage."

Writing elsewhere, Mr. Winchester has said that municipal ownership is a strictly business proposition and is more open to failure than any other form of public undertaking because the public is not always wise in selecting its business managers from among men noted for the highest integrity combined with business capacity, and keeping them on the job as long as they make good. It is a far greater responsibility and much more difficult to keep publicly owned utilities safe for the public than to properly control private interests of the same kind and make them fulfill their obligations. If the public is not able to exercise the proper degree of determination in getting from private companies what it is justly entitled to, it may not be capable of assuming the entire burden and conflicting obligations of being both the served and the serving.

"Private and public ownership are simply designations; there is nothing in a name that guarantees success. In either case, with politics out and clean, able management, with all methods, transactions and operations always open to the public, it matters very little what be the ownership. If the public insists upon this and safeguards its servants with equal justice, and keeps at it without let-up, it matters very little what may be the ownership; the public will be well served, either way. Keeping things dark often creates unjust suspicion, which is just as bad for one kind of ownership as it is for another."

The WEEK'S NEWS

Advice of State Officials in Federal Aid Road Program—Toll Roads in Pennsylvania—Illinois May Manufacture Road Materials—States Help U. S. in Venereal Disease Fight—Typhoid Vaccination in Army—Savannah Water Supply Improved—Filtration Proposed in Sacramento—Electric Light and Power Industry in U. S.—Lansing Owns Electric Plant—Seattle Takes Over Street Car Lines.

ROADS AND PAVEMENTS

State Representatives to Advise in Federal Aid Work.

Washington, D. C.—To bring about the most effective co-operation between the federal and state governments in the big program of highway construction now under way, A. R. Hirst, president of the American Association of State Highway Officials, has named, at the request of the Secretary of Agriculture a committee to act with the Department of Agriculture's Bureau of Public Roads in carrying into effect the federal aid road act and its amendments. Following are the state representatives selected by Mr. Hirst: George P. Coleman, state highway commissioner of Virginia; S. E. Bradt, state superintendent of highways of Illinois; Charles J. Bennett, state highway commissioner of Connecticut; W. S. Keller, state highway engineer of Alabama; and Ira R. Browning, state road engineer of Utah. Stimulated by recent liberal amendments and added appropriations to the original federal aid road act, road-building plans in the states have received tremendous impetus. Many of the states have provided, by large bond issues and otherwise, amounts much larger than will be required to match the federal appropriations. Up to May of this year, 1,057 project statements for federal aid roads had been approved by the Secretary of Agriculture. They involve the improvement of 10,580 miles of roads at an estimated cost of $92,933,121.81, of which the federal aid requested was $36,576,857.48. The amount of federal funds available on March 1 for road building was more than $72,900,000, which, under the law must be matched by an equal amount from the states, making a total of $145,800,000, which includes approximately $9,800,000 from federal and state sources for roads in the national forests. Funds that will become available on July 1, with equal contributions from the states, will provide an additional $198,000,000 for federal aid road work, making an aggregate sum of $343,800,000 available for the calendar year. It is expected, however, that the states will defer taking up part of the available funds until 1920. War conditions, which almost immediately followed the passage of the first federal aid act in July, 1916, brought scarcity of labor, materials and transportation, and restricted road-building projects to those absolutely essential to winning the war. Thus the road program was held back for more than a year at a time when demands for improved roads increased more rapidly than in any previous period. State and federal forces alike are working to get highway construction under way as rapidly as contracts can be let and as soon as road-building forces, somewhat disorganized during the war period, can again be placed on an efficient working basis.

To Eliminate "Maintenance" Contract Provisions.

Portland, Ore.—Because the exact legal meaning of the word "maintenance" has never been established, contractors who have laid pavements on some 163 streets of the city have been able to collect thousands of dollars from the city on maintenance claims, although the streets legally "maintained" may have to be entirely repaved when taken over by the city at the end of the ten-year term of maintenance stipulated in the contract. Commissioner Barbur arranged to take over quite a number of these claims last year, thereby saving the city considerable money and is now making negotiations towards the settlement of the sixty or more claims still open and unpaid by the city. Until five years ago all contracts let by the city included provisions that contractors should maintain the streets they had paved for a period of ten years at a cost of 2½ cents a square yard. With no exact definition of the word maintain, these so-called claims for maintenance were "pure velvet" to the contractors, according to commissioner Barbur. This provision has been eliminated from all contracts on street improvements at present, as the city is able to keep up the maintenance much cheaper than the contractors, because of the city paving plant.

Freeing Pennsylvania's Toll Roads.

Harrisburg, Pa.—With the aid of the counties, the commonwealth of Pennsylvania during the next two years may be able to remove from the state's highway system the last of the toll gates. With county aid, the commonwealth since 1913 has eliminated toll gates from 364.57 miles of state highway. The total cost was $1,321,119.57. During the two-year period beginning June 1, the state will have $500,000 available for purchase of toll roads on the state highway system. There are 178 miles of such roads. Toll roads on the state's system are found in counties in the southeastern section of the state, except for a six-mile turnpike in Cambria and Indiana counties. Mileage in the various counties is as follows: Lancaster, 36; York, 15; Adams, 12½; Bucks, 41½; Montgomery, 56¾; Delaware, 6; Berks, 4; Cambria, 4; Indiana, 2. The total approximates 177¾ miles.

Advises State to Manufacture Road Material.

Springfield, Ill.—Manufacture by the state of materials needed in making public improvements, including the building of roads, and study of the advisability of amending present laws to permit the use of patented materials are included in recommendations of the special legislative committee named by the legislature to investigate prices of building materials. The report of the committee, of which Senator John Dailey, of Peoria, is chairman, also urges the passage by the general assembly of a state forestry law, and memorialization of congress to present the need of a federal forestry policy. Such a program is declared to be necessary in order to conserve state and national timber supplies. No positive evidence was discovered by the committee to indicate that prices were established by combination of dealers in building materials. "The circumstances, however, indicate," the report says, "that cement prices are fixed by agreement." The report found the average total cost of manufacturing cement, including packing and administration, would be $1.25 a barrel. The inquiry of the committee was confined largely to the so-called basic materials—brick, cement and lumber, although some attention was given to sand, gravel and stone. In a special recommendation to the public, the report urges immediate building and expressed the belief that prices on building materials will not soon be much reduced.

"In view of our opinions expressed in this report, we believe it to be our duty as public officials to advise the public not to delay building projects in the hope that prices will come down materially. We do not believe they will. We deem it a part of wisdom to accept present conditions as normal and that building operations should be based upon that principle. With labor unemployed, with plants operating at great losses, owing to limited outputs, with necessary public and private improvements long delayed, there is serious danger of widespread business depression. All contemplated buildings, homes and improvements should be started now."

Discussing the recommendation that the state acquire facilities for the manufacture of building materials, the reports says:

"The direct interest of the state in a comprehensive system of road building makes it imperative that the state, as trustee for the people, should protect the public from extortionate charge for road building material. When the people voted for the $60,000,000 bond issue for hard roads it was with the express representation the road projects would not be instituted until the war was over. The overwhelming vote for hard roads was with the understanding that this work would not be commenced until prices were established and normal conditions resumed. The present unjustifiably high prices of road materials will restrict the road building program, reducing the mileage very appreciably. We believe that in view of all these circumstances the state should be authorized by law to manufacture products entering into the public improvements of the state.

"We therefore recommend to the general assembly for passage and to the governor the approval of an act enabling the state, through its department of public works and buildings, to accomplish the following:

"a—Acquire by condemnation under the eminent domain laws of the state lands, mines, quarries, mineral deposits or other property for procuring such raw materials as are necessary for the construction of public improvements.

"b—Sell and dispose of products so produced.

"d—Enter into contracts with producers and manufacturers for the supply to the state of raw materials and manufactured products necessary in the construction and maintenance of public improvements by the state.

"e—Extend credit and make loans to persons, firms or corporations to aid and assist them in producing such raw materials and manufactured products; such credit to be extended or loans made only when such persons, firms or corporations execute and furnish to the department of public works and buildings pledges, promises and guarantees sufficient to secure the state on account of such loans made or credit extended."

In explanation of the statement that no positive evidence was present to show combination of cement manufacturers to fix prices, although circumstances indicated that an understanding existed, the report says:

"Our basis for this conclusion is that different companies make exactly or approximately the same bids for the same work. As an illustration the Atlas, Lehigh, Marquette and Universal companies recently made a price verbally to the city of Chicago and to the county of Cook of $2.05 a barrel for the city and $2.08 a barrel for the county. The identity of bids is significant that such prices were the result of agreement. The Marquette plant is located in LaSalle county, Illinois, as is one of the Lehigh plants; the Atlas plant is located at Hannibal, Missouri and the Universal plant is located at Buffington, near Gary, Indiana. The freight rates from Hannibal to Chicago is 42 cents whereas the freight rates from Garry to Chicago is 19 cents. If Hannibal can furnish cement in Chicago at a profit, then the difference of 23 cents freight rate would indicate that the Gary plant is making an excessive profit at least of 23 cents a barrel on cement. Either this is true or the Hannibal plant is losing money or an agreement and understanding exists between these companies determining prices."

With reference to brick prices the report says:

"We have been informed by the brick manufacturers that brick cannot be sold for less than $12 per thousand in Chicago, delivered to the job, without depriving the manufacturers of a reasonable profit. This we are not prepared to dispute. The commission has been unable to establish by evidence that any illegal combinations exist to regulate the price of common building brick."

SEWERAGE AND SANITATION

Sue City for Odors from Sewer.

Birmingham, Ala.—Six suits have been filed in the circuit court by residents, against the city, asking damages in the amount of $30,000, it being alleged that the sewers did not function properly. The complaint stated that for several days after October 29, 1918, the sewers supposed to care for the needs of the residents signing the petition overflowed and gave forth offensive odors. This condition is alleged to have lasted until January 26, 1919, although it is alleged that the matter had been reported to the city officials, but no action was taken until January. Commissioner of health, H. P. Burruss said that the only solution to the problem would be a new system. According to a statement given out: "The sewerage trouble is one that has been felt by every city administration for the past 10 or 15 years. Each has passed the buck right along to the next administration, making such makeshift improvements as they could. One of the first actions of the present commission was to hold a conference to see what might be done to relieve the situation. January 29 the commission passed a resolution instructing the city engineer to make a survey for an adequate sewer system for the city. Doubtless, such a system will at least be begun under the present administration. Municipal improvement bonds may be issued. Last year, for the first time in the history of Birmingham, bidders for our municipal improvement bonds offered a premium on them. Only a few were sold because we needed just a small amount of money to make repairs and do small extension work. There will be no trouble in getting the necessary finances. The system of storm sewers needed will cost a large amount, running into the millions. A long time will be required to complete the work. But the present city commission will push the matter through. It may be expected that relief in the way of improvements that will last will be made."

Most States Help U. S. in Health Campaign.

Washington, D. C.—The law enforcement division of the Commission on Training Camp Activities reports that the following states have not complied with the provisions of the Chamberlain-Kahn Act by passing the necessary laws to be qualified as beneficiaries for the fiscal year 1918-1919: District of Columbia, $3,599.66; Missouri, $35,807.91; New Mexico, $3,558.70; Pennsylvania, $83,341.55; Tennessee, $23,754.87. Reports to date show that legislation on venereal disease control has been introduced in thirty-three states—Alabama, Arizona, Arkansas, California, Connecticut, Delaware, Idaho, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Missouri, Nebraska Nevada, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Tennessee, Utah, Vermont, Washington, Maine, New Hampshire, New Mexico, Wisconsin, Wyoming. If the states receive the Federal aid for the fiscal year 1919-1920, the state legislatures must grant an appropriation for the continuance and extension of venereal disease control. The necessary bills have already been passed by North Dakota for $12,548.48; Oregon, $25,000; South Carolina, $10,000; Wisconsin, $50,000; Wyoming, $4,000, and West Virginia, $7,000.

Army Typhoid Vaccination Not Properly Effective.

Washington, D. C.—Charges of carelessness and negligence in preventing the spread of typhoid and paratyphoid fevers in the army are made against many medical officers serving with the forces overseas in a circular published by the surgeon of the American Expeditionary Forces and made public here by the public health service in connection with a warning that vaccination does not give complete immunity from typhoid. The chief surgeon cites many instances where epidemics prevailed among troops, especially during the last offensives on the western front, and points out that the occurrence and distribution of diseases was constantly brought to the attention of the medical officers through weekly bulletins. "It would appear," the circular continues, "that many officers utterly failed to grasp the significance of these reports and warnings, a fact which may be due to a false sense of security under the popular belief that vaccination against typhoid and paratyphoid gives complete immunity even in the midst of gross unsanitary conditions. Notwithstanding the fact that typhoid and paratyphoid fevers are epidemic in the United States and in spite of our extensive experience with these diseases during the Spanish-American war, and later during the period of mobilization on the Mexican border, it is evident that many medical officers have gained but little knowledge of the fundamental principles underlying prevention and control. It is also quite evident that some medical officers are grossly careless and neglectful of their duties and responsibilities as medical officers and sanitarians." "It is fully recognized," the circular says, "that conditions brought about by the mobilization of millions of men and the active participation in the war of two million of these men have at times rendered sanitary control extremely difficult, especially during the stress of active combat. The high standards of sanitation and personal hygiene set by the army medical department during the previous decade, it adds, were not lived up to during the past year and a half, due to a combination of factors, the most important of which was the lack of facilities and material transportation difficulties and insufficient training and personnel." In a brief review of

the occurrence of typhoid and paratyphoid fevers in the expeditionary forces, the chief surgeon says that until June, 1918, few cases occurred and the rate was within the expected limits. From then on, however, it appears the disease spread through many units. During the Chateau-Thierry offensive, the circular discloses, approximately 75 per cent. of the troops engaged were afflicted with diarrhoeal diseases, such as simple diarrhoea, bacillar dysentery, typhoid and paratyphoid. "The high incidence of intestinal diseases in this sector," the chief surgeon says, "was due to entire disregard of the rules of sanitation." Both dysentery and typhoid-paratyphoid fevers were demonstrated to have prevailed to some extent after the St. Mihiel offensive, but the epidemics of pneumonia and influenza prevailing at that time overshadowed all other medical admissions. Following the offensive in the Argonne, typhoid and paratyphoid began to be reported from virtually all divisions engaged, and, according to the chief surgeon, it was quite evident the initial cases were due in large part to the drinking of infected water. In July, 1918, a replacement unit consisting of 248 men from Camp Cody, New Mexico, reached England with typhoid prevailing extensively; 98 men, or 39.5 per cent, had the disease, and the death rate was 8.42 per cent. From the investigation it was concluded that the men were exposed to infection through drinking water while traveling across the United States. The unit had been vaccinated a few months prior to the epidemic. The chief surgeon declares that in many instances patients, some of whom were wounded, passed successfully through camp, field, evacuation and base hospital without any documentary evidence that typhoid or paratyphoid was even suspected in their cases. In not a few cases it remained for pathologists to make a diagnosis at the autopsy table. A number of new regulations requiring all medical officers in forces overseas to report immediately even suspected cases of typhoid have been published by the chief surgeon.

WATER SUPPLY

Improving Savannah's Water Supply.

Savannah, Ga.—The signing of a contract by the mayor to install a well in the southern part of the city, that will supply three billion gallons of water per day, is the first move in the drilling of a series of wells in order to eliminate the condition of the entire water supply coming into the city through the main on the west side. The well will be sunk in Ardsley Park, and will be ready for use in six months, says mayor Stewart. It will then be connected with the Abercorn street main. This will relieve one-fourth of the city's supply coming into the city now from the west side. Since the present administration took charge three months ago, there has been steady progress in placing electric pumps on the wells. Superintendent L. A. East, of the water department, has installed equipment that will give one million gallons more per day in the west side wells. A second electric pump has been placed on the well at the Brinson Railway, 1,500,000 more gallons per day, thus being added to the capacity of the pumps. It is hoped within twelve months to have two wells of three million gallons capacity each, on the east side and four of one and a half million gallons capacity on the west side, in operation by electric pumps. This will enable the city to shut down the present steam plants. The saving in cost of operation of these pumps will, it is estimated, pay for the new plants in two or three years.

Commission Has No Power Over Franchise Rates.

Seymour, Ind.—John H. Edwards, of Mitchell, serving as special judge in an injunction proceeding filed by the Seymour Water Company against the Indiana public service commission in an effort to prevent the enforcement of lower rates in this city, has ruled that the commission has no authority to alter or modify existing rate schedules in Seymour, as they were fixed in a franchise granted to the city prior to the creation of the commission. The commission recently ordered a 10 per cent. discount on all bills, including municipal water rentals, which were paid within ten days after they became due. The company insists that the appraisement of its property is too low and is unjust. The case has been fought through the courts for the last four years and while no action was taken, it is generally understood that the state will appeal the case to the Indiana supreme court, as the effects of the decision by Judge Edwards is far reaching. When the ruling of the commission was announced, the local water company obtained a temporary injunction against its enforcement and the discount has never been given. The commission was represented by Ele Stansbury, attorney-general of Indiana. O. H. Montgomery, of this city, represented the water company, and John M. Lewis, of Seymour, represented the city of Seymour as an interested third party to the suit. The Seymour Water Company had not surrendered its franchise. Early in the life of the public service commission the company brought an action in the federal court to restrain the commission from regulating water rates on the ground that to do so would abrogate a franchise contract with the city of Seymour. A constitutional question was involved in this proceeding. The federal court held the public service commission had jurisdiction. Then the commission went ahead and fixed water rates for Seymour.

To Vote on $2,400,000 Filtration Plant Bonds.

Sacramento, Cal.—The city commissioners have ordered that the proposition of voting $2,400,000 in bonds to install a filtration system to provide the city with clear water from the Sacramento River be submitted to the people for approval at an election to be held not later than two weeks after the general city election which fell on May 17. The subject was brought before the commission by George Maddock, chairman of the water committee of the Chamber of Commerce, who said the committee approved the report of engineer C. E. Grunsky favoring filtration and recommended that an election be held and follow Grunsky's suggestion that a bond issue of $2,400,000 be voted. The Chamber of Commerce Committee, in recommending Grunsky's report, claims that the following steps should be taken:

1. That steps should be taken to bond the city to the extent of $2,400,000 for the purchase of a site and the erection thereon of a pumping and filtration plant, and that the water be drawn not only from a hollow tower or pier, but also by means of a caisson whose lower edge would reach some forty or fifty feet below the low water mark of the river. The caisson system would have the advantage of getting water that is naturally filtered on the bed of the river.
2. That investigations be continued as to the well-water supply that could be obtained from wells sunk east of the city.
3. That negotiations be opened at once with the Oak Park Water Company for the acquisition of their properties to be used as a stand-by in case the filtration plant was out of commission temporarily.

Water Supply Found Satisfactory.

Oswego, N. Y.—That Oswego's water supply is satisfactory is the announcement received from the state board of health, in which a report is made of an inspection of the city supply by assistant engineer Earl Devendorf. The report shows that the department uses the liquid chlorine method of sterilization as recommended by the board, using eight pounds of chlorine a day, which is applied to the raw water in the suction well of the pumps. This is at the rate of about 0.17 parts per million by weight. The chlorine apparatus, it is stated, is at all times carefully operated under analytical control and, the department as a further safeguard of its supply, the report says, has installed double check valves on supplies from the Oswego river, which several industrial plants use as fire supplies. "At the time of the inspection samples of water were collected and the results of these analyses show a water slightly colored and turbid and hard," the report goes on. "The figures for nitrogen in its various forms, for oxygen consumed and for chlorine, compare closely with those usually obtained in analyses of Lake Ontario water. The total bacterial counts in the chlorinated water are low and the absence of organisms of the B. coli type indicate that the treated supply was free from active contamination at the time of the inspection. In view of the above facts

the following conclusions may be drawn: 1. That the public water supply of the city of Oswego, although somewhat hard, is of reasonably satisfactory physical quality. 2. That although the location of the point of intake is such that a raw water of fairly satisfactory sanitary quality is obtained, the ever-present possibility of contamination from lake steamers, from shore wash or from the Oswego river reaching the water in the vicinity of the intake renders it essential that efficient sterilization of the supply be carried on at all times. 3. That the amount of chlorine being applied at the time of the inspection appeared to be too close to the minimum amount capable of giving uniformly effective sterilization to assure adequate protection to the sanitary quality of the supply. I would, therefore, recommend: 1. That the city authorities continue to operate the chlorination plant effectively at all times and with regular analytical control. 2. That, consideration be given to increasing amount of chlorine applied to a minimum of 0.20 parts per million by weight and to increase this rate whenever the bacterial examination indicates the need for larger amounts of chlorine."

STREET LIGHTING AND POWER

Electric Light and Power Industry of U. S.

Washington, D. C.—According to a report by the Department of Commerce, the electric light and power stations in the United States during the year 1917 generated more than 25,000,000,000 kilowatt hours of electric energy, producing an income of more than a half billion dollars, and gave employment to more than 100,000 persons, whose salaries and wages aggregated nearly $100,000,000. The output in 1917 was more than double that for 1912 and more than quadruple the output for 1907. The report covers both commercial and municipal plants, but does not cover electric plants operated by factories, hotels, etc., which generate current for their own consumption, plants operated by the federal government and state institutions, nor plants that were idle or in course of construction. The figures show great strides in the industry during both of the five-year periods, 1907-1912 and 1912-1917. The output of electric energy by the light and power stations increased at a considerably greater rate and their expenses at a slightly greater rate than their income, and the rate of increase in the number of persons employed was much smaller, particularly during the later five-year period, than that in the amount of business done. The total number of establishments increased from 5,221 in 1912 to 6,541 in 1917, the latter comprising 4,224 commercial and 2,317 municipal establishments. The increase indicated by these figures is somewhat misleading, since 2,296 new establishments came into existence between 1912 and 1917, but as a result of combinations in the commercial systems and various other changes the net increase was only 1,320, comprising 565 commercial and 755 municipal stations. The total income of the stations in 1917, of which 95.3 per cent represented electric service, amounted to $526,886,408, an increase of 74.3 per cent as compared with 1912 and of 200 per cent as compared with 1907. The total expenses were $427,136,049, or 82.1 per cent more than in 1912 and 218.3 per cent more than in 1907. The employes of the light and power stations numbered 105,546, an increase of 33 per cent over 1912 and of 121.6 per cent over 1907, and their salaries and wages aggregated $95,239,954, an increase of 55.7 per cent as compared with 1912 and of 168.9 per cent over 1907. The total primary power in 1917 amounted to 12,857,998 horsepower, an increase of 70.8 per cent as compared with 1912 and of 213.7 per cent over 1907. Of this power nearly two-thirds—8,389,389 horsepower—was derived from steam; almost one-third—4,251,423 horsepower—from water; and the remainder—217,186 horsepower, or less than 2 per cent—from internal combustion engines. The corresponding proportions for 1912 and 1907 differed but slightly from those just stated. The average horsepower per steam engine shows a very great increase —from 334 in 1907 to 631 in 1912 and to 1,124 in 1917. The average horspower of the water wheels also shows a marked increase from census to census, but in the case of the internal combustion engines there has been a decline. The total dynamo capacity, 9,001,872 kilowatts in 1917, represents an increase of 74.3 per cent as compared with 1912 and 232.2 per cent over 1907, these rates of increase being slightly greater than the corresponding ones for total primary power. The output of electrical energy aggregated 25,438,611,417 kilowatt hours, an increase of 119.9 per cent for the period 1912-17 and of 333.9 per cent for the decade. Of the 6,541 establishments reported for 1917 those which purchased all their electric energy from other establishments numbered 1,422, as against 507 in 1912 and 227 in 1907. The figures indicate that the arc lamy for street lighting is being fast superseded by the incandescent of various types. The former class of lamps decreased in number from 348,643 in 1912 to 256,838 in 1917, the reduction amounting to more than one-fourth; while during the same period the number of incandescent lamps more than doubled, increasing from 681,957 to 1,389,382.

City to Take Over Electric Plant.

Lansing, Mich.—After lengthy litigation and also competition of many years between the city and the Michigan Power Company, a value on the company's plant has been fixed. Judge Tuttle, of the federal Eastern District court, has fixed the value of the plant at $1,124,805. This decision by the court is the result of a gentlemen's agreement between a special committee representing the city in the proposed purchase of the Michigan Power Company and David R. Thomas, receiver for the Michigan Power Company, and Mr. York, chairman of the bondholders' committee of the Michigan Power Company. Under the terms of this agreement it was understood that the plant should be appraised by experts to be picked by the court from lists submitted by the special committee and the bondholders. Appraisement was to be made on the basis of the fair, honest value to the owner, in the opinion of the appraiser, of the entire properties of the Michigan Power Company. The city reserved the right to exclude undeveloped water rights from the purchase. The appraisal was to be subject to review and approved by the court. Another provision of the agreement was that the expense of all new equipment added to the property and installed by the receiver under direction of the court was to be added to the amount of the appraisal, including the cost of the appraisement. The present mortgage on the property, it was understood by the parties, was to be foreclosed and a new company formed to take over the property. It included the placing of new bond issues secured by mortgages on the property, based upon its appraisal value as finally determined by the court, with the cost of new equipment and of the appraisement added. The parties further agreed that there should be two bond issues, the first to be called "A" bonds, to cover cost and expense of new equipment and appraisement, to mature in five years, one-fifth each year, and to bear interest at such rate as money may be procured. The second issue, or "B" bonds, was to cover the amount of the appraisal bearing interest at 5 per cent and to mature not later than 1935, with the privilege on the part of the city of retiring all or a part of the bonds at interest due date at $101. The mortgage was to contain a provision for a sinking fund each year after the first five years on "B" bonds sufficient to retire them. It was also understood that the holding company when organized and after taking over the property should turn the plant over to the city of Lansing or its authorized agent for the nominal sum of $1, subject to mortgages securing the bond issue. The figure that was fixed by the court is less than the valuation made by the appraiser for David R. Thomas, receiver for the company, but is more than the amount which the city proposed to pay. The original appraisal made by Esselstyne, Murphy & Hanford, Detroit, was attacked by the city on the ground that it was made on the basis that the company was a growing concern, when as a matter of fact the concern was in the hands of the receiver. The city also claimed that the so-called "receiver's appraisal" was excessive on real estate valuations. This appraisal amounted to $1,-

253,076; the court reduced this to 75 per cent of that value, or $939,805. To this amount was added $185,000, as the price of a new turbine which has been added.

TRAFFIC AND TRANSPORATION

Municipal Ownership Survey.

Milwaukee, Wis.—By a recent resolution, the president of the common council has appointed a committee on street railways and electric power requisition consisting of seven members, three councilmen and four others, to investigate the possibilities of municipal ownership. The committee, which may engage a paid secretary and employ experts and assistants, is to report on the following subjects, which form an outline of the survey:

1. Economies, if any, to be worked through the city ownership of properties.
   (a) Can any money be saved on street sprinkling?
   (b) Can money be saved on court and legal expenses?
   (c) Can money be saved on maintenance?
   (d) Can money be saved in salaries?
   (e) Can money be saved in the use of property; for instance, like renting out a large portion of the space in the Public Service building?
   (f) Can money be saved on snow removal?
   (g) Can money be saved on garbage collection?
   (h) Can money be saved on ash collection?
   (i) Can money be saved on rubbish disposal?
   (j) Can money be saved by joint reading of water and electric meters?
2. Can the revenues be increased under municipal ownership?
   (a) Is it not possible to increase the riding habit of the public?
   (b) Would not the hauling of freight increase the revenues?
   (c) Cannot the use of electric energy for lighting be further stimulated in Milwaukee?
3. Cannot the service problem be better worked out under municipal ownership?
   (a) Could the routing of cars be improved?
   (b) Would not the immediate acquisition of more cars increase the riding habit and in turn increase the revenues?
   (c) Would not greater willingness to make extensions of street railways and electric service lines stimulate consumption and in turn increase revenues?
4. What properties are to be acquired?
   (a) Merely the local city street car lines, or
   (b) The street car lines an delectric lighting lines within the city, or
   (c) Both of the above within the city and the interurban municipalities within the county, or the entire holdings of the Milwaukee Electric Railway & Light Company and the Milwaukee Light, Heat & Traction Company, or
   (d) Some other division to be suggested by the committee.
5. Cannot the future development and the growth of the city be better worked under municipal ownership, in view of the fact that extension of lines can be along the natural arteries of travel and can be made in accordance with municipal developments and the growth of industrial activities?
6. Inquire into the recent valuation of the Railroad Commission and report upon the accuracy, fairness and completeness of the same.
7. Include in the report a financial plan of acquisition and reorganization.
8. Include in the report some plan of future management determined by the committee to be feasible and preferable.
9. Are there other reasons for or against municipal ownership ?

Seattle Takes Over Its Street Cars.

Seattle, Wash.—The street railway system is now in the hands of the city, all the property bought having been transferred to the superintendent of public utilities, Thos. F. Murphine. The purchase involved the transfer of 206 miles of track, 600 cars, several car barns, repair shops, warehouses and supplies, as well as real estate. The employes, numbering 1,200 conductors and motormen, and 600 others are now employes of the city. On recommendation of superintendent Murphine, council passed an ordinance instituting a wage scale for conductors and motormen, giving $4.25 per day for the first six months, $4.50 for the second six months, and $4.75 per day thereafter. The whole operating organization of the company, from superintendent Henderson to laborers, was transferred almost intact. A. W. Leonard, president of the Puget Sound Traction, Light & Power Co., after the system was formally taken over, made the following statement: "The city can do many things for the car lines that no private company could do, and which it could not very well do, perhaps, with the lines under private management. It can lower costs of operation by freeing itself from burdensome taxation. It can borrow money for extensions and development on better terms and at lower rates of interest than the company could with so many of its franchises approaching the time of expiration. It can pay dividends to its stock holders—the public—in service instead of money. It can reduce the cost of accidents and some of the costs of accounting and legal service through the co-operation of the other city departments. It can greatly facilitate operation by securing the co-operation of the street and police departments in the regulation of traffic. The city can eliminate unfair competition and adopt practices, like the skip stop, which will effect very material savings."

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Retirement of Firemen.—Physical Disqualification.

(N.Y.Sup.) Under Greater New York Charter, § 790, providing that the fire commissioner shall have power to retire any member of the uniformed forces who may be found upon examination by the medical officers to be disqualified, the commissioner shall determine as a fact whether the disability exists, and, if so, whether it is total or partial, and the certificate or finding of the medical officer is not conclusive upon him.—People ex rel. Kane v. Drennan, 173 N. Y. S. 879.

Political or Quasi Corporations.—Municipal Corporations.—Distinction.

(Okla.) Cities, towns, and villages are municipal corporations proper, while counties, townships, school districts, road districts, etc., are political or quasi corporations; there being an established difference between the two classes of corporations, so that a principle applicable to one class is not necessarily applicable to the other.—Honnold v. Board of Com'rs of Carter County, 177 P. 71.

Limiting Municipal Functions.—Power to Build Ice Plant.

(Wash.) Any doubt as to proprietary powers of municipal corporation must be resolved against it; the policy of the law being to limit rather than to extend such functions. —State v. Port of Seattle, 177 P. 671.

Under Laws 1917, p. 498, §1, port of Seattle had no authority to build ice-manufacturing and cold storage plant as incident to its business of warehousing largely in excess of needs of such business, and thereafter to sell ice to others engaged at retail in selling ice.—Id.

Unreasonable Exercise of Power—Act of General Assembly.

(Ill.) Where legislative power is delegated to the General Assembly to municipalities in general terms, it is implied that the power shall be reasonably exercised, and citizens will be protected by courts against an illegal, unreasonable, or oppressive exercise of the power.—Catholic Bishop of Chicago v. Village of Palos Park, 121 N. E. 561.

An ordinance passed pursuant to express power granted by General Assembly is regarded as an act of the General Assembly itself and cannot be set aside by courts on ground that it is unreasonable.—Id.

Counties May Not Issue Bonds for Dirt Roads.

Austin, Tex.—Commissioners' courts have no authority to issue bonds to construct "dirt roads" under Chapter 2, Title 18, R. S. 1911, according to the opinion of the attorney general. The opinion holds that counties are authorized to take over bonded debts of road districts therein, to issue bonds to pay for district roads constructed and to further construct roads to the end that district roads may be connected up and merged into a general county system. Another opinion holds that expense of changing a roadway because of levee construction may be borne by the county, but if the commissioners' court refuses to bear this expense it devolves upon the levee district. A third opinion holds that the commissioners' court may, with the consent of the city, pave the courthouse square and streets leading thereto and connecting with county public roads.

NEWS OF THE SOCIETIES

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

June 17-19.—TRI-STATE WATER AND LIGHT ASSOCIATION OF CAROLINAS AND GEORGIA. Ninth annual convention, Greenworth, S. C. Secretary treasurer, W. F. Stieglitz, Columbia, S. C.

June 17-20.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, St. Paul-Minneapolis. Secretary, Charles W. Hunt, 33 W. 39th St., New York, N. Y.

June 23-26. — SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, Coates House, Kansas City, Mo. Secretary, E. L. Fulkerson, 617 Washington St., Waco, Tex.

June 24-27.— AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University of Pennsylvania.

June 24-27.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

Aug. 26-28.—LEAGUE OF CITIES OF THE THIRD CLASS IN PENNSYLVANIA. Twentieth annual convention, Allentown, Pa. Secretary, Fred H. Gates, city clerk, Wilkes-Barre, Pa.

Oct. 27-30.—AMERICAN PUBLIC HEALTH ASSOCIATION. Annual meeting, New Orleans, La. Secretary, A. W. Hedrich, 169 Massachusetts ave., Boston, Mass.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Springfield, Ill.

American Water Works Association.

The thirty-ninth annual convention of the American Water Works Association will be held June 9-13 in Buffalo, N. Y., with headquarters at the Iroquois Hotel.

The first day will be devoted to registration, to meetings of the executive and other committees and in the evening to a reception and dance tendered by the Water Works Manufacturers' Association.

The convention will be opened on Tuesday morning with an address of welcome by A. W. Kreinheder, commissioner of public works of Buffalo. John E. Teeple and John A. Kienle will then present a paper on "The Relation of the Chemical Industry of Niagara Falls to the Waterworks." There will follow a round-table discussion on "Damage to Fire Hydrants by Motor Vehicles and Remedies Therefor," the suggestions being (a) moving hydrants from the curb back to the building line; (b) substituting flush hydrants for the post style hydrant; (c) placing post fenders around hydrants; (d) making no change in previous practice as to location of hydrants, but repairing broken hydrants at minimum cost by welding stand pipes. In this connection, information and suggestions as to practice are requested from members.

At the afternoon session will be presented the report of the committee on "Private Fire Protection Service," by Nicholas S. Hill, Jr., chairman. This will be a final report, and very important and complete. The Question Box will be opened after the report is completed.

At the evening session the following papers will be read on the Buffalo water supply, illustrated by lantern slides: "Buffalo Water Supply with Special Reference to the Filtration Problem" and "Reduction of Water Consumption by Means of Survey and Constant Inspection." There will also be a paper on "The Uniflow Pumping Engine," by D. A. Decrow. The Water Works Manufacturers' Association has arranged a theatre party for the ladies for this evening.

The Wednesday morning session will be devoted to a discussion of prices and to a business meeting. There will be a series of papers by U. S. Government officials and manufacturers on "The Trend of Prices." The president of the association will deliver his address and the treasurer, secretary, and committees will report. The 1920 convention place will be selected and candidates for the nomination committee nominated.

At the afternoon session William J. Orchard will read a paper on "Purification of Water for the Army and Field Purification Plants" and John Oliphant will discuss the subject "Air Lift and Water Purification." At 3 p. m. autos provided for the occasion will take the members for a trip to the Buffalo water works pumping station.

The evening will be devoted to a card party for the ladies, prizes being furnished by the Water Works Manufacturers' Association. This association will also entertain the members at a smoker in the Hotel Statler.

At the Thursday morning session Leonard Metcalf will read a paper on "The Effect of the War Period, 1914-18, and Public Control Upon Water Works of the United States." Other papers on this subject, showing the effect of the war on operating costs, will be read.

Thursday afternoon will be devoted to a trip to Niagara Falls, the manufacturers supplying the tickets.

On Friday there will be an informal "get-together" session, at which members will give informal talks on "Personal War Experiences."

A golf tournament will be held during the convention, the manufacturers furnishing the prizes. There will also

(*Continued on page 378*)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Cameron Parish Road Districts No. 3. 4 and 5, Cameron, La., will sell $390,000 bonds for HIGHWAY CONSTRUCTION. The consulting engineer is T. H. Mandell.

Cedar Rapids, Ia., will advertise for bids in July for the construction of a concrete BRIDGE to cost $250,000. The consulting engineers are the Marsh Engineering Co.

Osage, Ia., is to build a SEWERAGE SYSTEM to cost from $175,000 to $200,000, according to plans prepared by the consulting engineering firm, the Charles L. Pillsbury Co.

Somerton, Ariz., is to build WATERWORKS and SEWERAGE SYSTEMS to cost $70,000 and $30,000 respectively. Plans are being prepared by the consulting engineers, Olmsted & Gillelen.

WATERWORKS IMPROVEMENTS, including a reservoir and pressure tank, are to be made by the city of Albert Lea., Minn., according to plans prepared by the consulting engineer, J. H. A. Brahtz.

Whittier, Cal., is having plans prepared for extension and improvements to WATER SYSTEM, including developing new supply and increasing storage facilities, to cost about $300,000. The consulting engineer is J. B. Lippincott.

Aberdeen, S. D., is to build stormwater SEWERS, for which $350,000 will be voted. Preliminary plans were prepared by the consulting engineers, Burns & McDonnell.

Erie, Pa., is to build a RESERVOIR with total capacity of thirty million gallons, to cost $250,000, according to plans prepared by the consulting engineers, Chester & Fleming.

WATERWORKS IMPROVEMENTS, involving the construction of a dam, are to be made by Decatur, Ill., for which plans are being prepared by the consulting engineer, S A. Greeley. The estimated cost is $500,000.

The city of Barberton, O., has advertised for bids for the construction of a SEWER SYSTEM. Plans were prepared by the consulting engineer, R. Winthrop Pratt.

A sanitary SEWER AND SEWAGE DISPOSAL PLANT is to be built by the city of Churdan, Ia. Plans are being prepared by the consulting engineer, C. H. Currie.

Aurora, Ont., plans SEWERAGE IMPROVEMENTS to cost about $100,000, involving the installing of vitrified sewers and septic tanks. The consulting engineers, James, Loudon & Hertberg, have been retained by the city to prepare estimates.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

NORTH SEWAGE SCREEN

For Dewatering Sewage Without Use of Heat.

This is a screen of the drum type which is used for dewatering sewage, pulp and other highly diluted materials. It consists of a drum or cylinder formed of wire screening supported by a steel frame work consisting of two end wheels and lateral ribs. This drum revolves with its lower half suspended inside a vat into which falls the liquid which passes through the screen.

The sewage or other water carrying suspended matter enters at one end of the drum and passes out through the screen into the vat, from which it is drained away to the sewer or other place of disposal. The suspended matter adheres to the wire screen, dropping from the screen, as it approaches the top, into a trough which extends the full length of the drum. Particles of suspended matter too large to adhere to the screen are carried up by radial shelves which are attached to the inside of the drum, which dump such particles into the trough as they are brought to the top during the revolving of the drum. A water shower discharged against the screen from a pipe outside of the same and extending the full length of the drum dislodges from the wire the solid matter adhering to it. Another water pipe placed just beyond the further side of the trough thoroughly washes each part of the screen at each revolution.

The trough has steep sides and is semi-circular at the bottom, a screw conveyor revolving in the semi-circular bottom and moving the matter collected in the trough toward the further end where it is delivered into a cart or other receptacle. This bottom of the trough is perforated so as to afford further opportunity for escape of the liquid. The screw conveyor, as it pushes the matter along the trough, compresses it and squeezes out a part of the water still contained.

The wire screen is fastened on in strips or narrow segments from the outside, and any segment can be renewed with little trouble. The drums are made five feet in diameter and in standard sizes of 6, 8 and 10 feet long. The last has a capacity of one million gallons of sewage in 24 hours. Only one horsepower is required for driving the machine.

SEWER PIPE GASKETS.

Non-Destructible—of G-K Material.

A gasket for use in laying sewer pipe which is moulded to the desired size and can therefore be applied more quickly, will fill the joint space for the entire circumference of the pipe and which will not rot, is being offered as a substitute for jute or oakum gaskets by the Atlas Company. This gasket is made of the well-known G-K material, molded in strips 1-32 inch less in thickness than the standard annular space of sewer pipe joints and one inch wide and cut to the proper length for the size of the pipe for which it is to be used. The material can thus be inserted easily and insures a complete filling of the entire annular space, and light calking will expand it to fill the entire space.

One advantage claimed for this gasket is that it does away with the trouble of ends or loops of jute protruding into the sewer. It takes much less time to use one of these than to roll and calk into place a length of jute to be used for the same purpose. Where G-K material is used for the joint, it is found to bond perfectly with the gasket. These gaskets are acid-proof and are being used on an acid pipe line in New York 1,110 feet long. It is claimed by the manufacturers that the material cost of the gasket is no greater than that of an equal depth of calked dry jute at the present price of that material (ten cents a pound) and that there is a decided saving in the time of applying it. The gaskets are furnished packed in boxes of one hundred, there being stenciled on each box the size of pipe for which its contents are intended.

The company is also preparing a runner to be used in place of the asbestos runner, the G-K runner to be left on the pipe and to become an integral part of the joint, so that the back-filling can be begun as soon as the joint is poured.

INDUSTRIAL NEWS

Work of Industrial Board.

The following is part of a statement that has been made by Secretary Redfield, of the Department of Commerce, in connection with his acceptance of the resignations of the members of the Industrial Board: "That board was conceived in the spirit of unselfish public service and has so acted from the beginning. I repeat what was said already: There has been no change in its viewpoint, policy, or attitude from the beginning. No

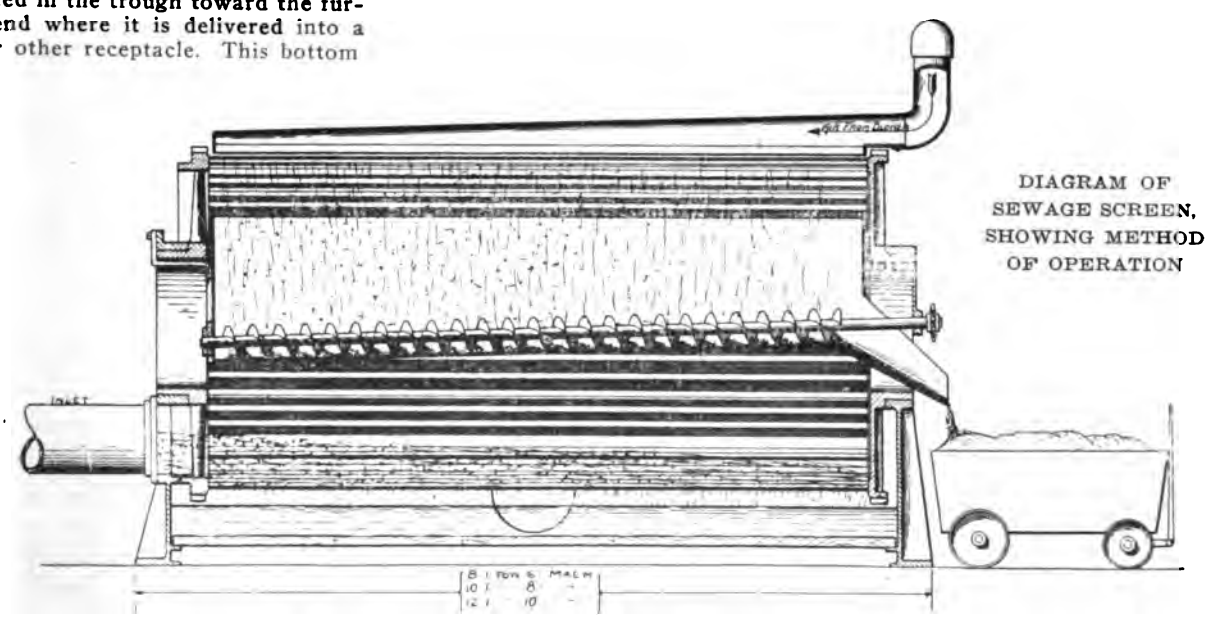


DIAGRAM OF SEWAGE SCREEN, SHOWING METHOD OF OPERATION

statement nor inference to the contrary has a basis of fact. It has had the widespread support of industry and commerce throughout the country. It has sought merely to serve and has been ready to consider all figures, to respect all facts, and to reconsider any statement or conclusion in the light of further knowledge. Its mind has been open and its purpose was directed not to winning a controversy but solely and simply to serving the country. I believe it has developed standards of public cooperation which will be of permanent value."

"Reinforcing of Concrete Roads and Pavements."

Under the above title the **Truscon Steel Company,** Youngstown, O., has issued a circular describing the use of steel reinforcement in concrete highway construction. "Truscon Road Mesh" is described and illustrated and its use shown on the Baltimore pike route. "Rib Metal" and "Truscon Armor Plates" are also shown.

The Elgin Sales Corporation, 501 Fifth ave., New York City, and 1340 Old Colony Bldg., Chicago, announces that its sales of Elgin street cleaning machines has reached the 100 mark. These 100 machines represent 78 different buyers, the other 22 machines being "repeat" orders. Recent installations of Elgin machines are in the cities of Havana, Cuba; Kalamazoo, Mich.; Yonkers, N. Y.; Bridgeport, Conn. (second machine), and Malden, Mass.

The Walter A. Zelnicker Supply Company in St. Louis has just appointed Mr. F. X. Meehan as advertising manager. Mr. Meehan comes to the Zelnicker organization with a very broad experience, having been associated in various executive capacities, with Fairbanks, Morse & Company and other concerns. Mr. Meehan was a very active "four minute man" during the war, having made over five hundred patriotic speeches.

Electrical Safety Conference.

Following recommendations from the Electrical Manufacturers' Council, representing the Electrical Manufacturers' Club, the Electric Power Club and the Associated Manufacturers of Electrical Supplies, there has been organized a new body, known as the Electrical Safety Conference, for the consideration of accident and safety questions relating to electrical manufactures and products. The organizations co-operating for the formation of this conference are the Associated Manufacturers of Electrical Supplies, the Electric Power Club, the Underwriters' Laboratories, the National Workmen's Compensation Service Bureau and the Bureau of Standards, each of which is represented on the conference by two members, who have been appointed as follows

For the Associated Manufacturers of Electrical Supplies—A. W. Berresford, Cutler-Hammer Company, Milwaukee, Wis.; S. L. Nicholson, Westinghouse Electric & Manufacturing Company, East Pittsburgh.

For the Electric Power Club—A. H. Moore, General Electric Company, Schenectady, N. Y.; Clarence C. Collens, 2d, Reliance Electric & Engineering Company, 1086 Ivanhoe road, Cleveland.

For the Underwriters' Laboratories—W. H. Merrill, 207 East Ohio street, Chicago; Dana Pierce, 25 City Hall place, New York.

For the Bureau of Standards—Dr. Morton G. Lloyd and Dr. E. B. Rosa, Bureau of Standards, Washington, D. C.

For the National Workmen's Compensation Service Bureau—Albert W. Whitney and L. L. Hall, 45 Park Row, New York.

The officers are: A. W. Berresford, chairman; A. W. Whitney, vice-chairman; Dana Pierce, secretary-treasurer.

The objects of the conference are stated as follows:

To promote by co-operative effort the orderly, consistent and proper development of practice in electrical manufactures and installations with regard to accident hazards.

To promote the development and adoption of safety standards for the construction and test of electrical appliances and for their application and installation.

To interpret and make uniform the application of electrical safety codes both in regard to general principles and in regard to particular classes of appliances and systems.

The active work of the conference as between the different co-operating associations will be conducted by means of special committees appointed from time to time, which will report back through the conference to the associations for the purpose of securing agreement and uniformity of action.

NEWS OF THE SOCIETIES

(*Continued from page 376*)

be trips to local factories of water works appliances. The manufacturers, as usual, will display a large number of exhibits.

New York State Conference of Mayors and Other City Officials.

Six important municipal problems will be considered by the New York State Conference of Mayors and Other City Officials at its annual meeting to be held at Schenectady on June 10, 11 and 12. As this is the tenth anniversary of the cities' organization, plans have been completed to make the program and the entertainment more attractive than usual. Three sessions will be held on each day, with the exception of the last, when the officials will be entertained by the city during the afternoon.

At the opening session mayor Walter R. Stone, of Syracuse, president of the conference, will discuss the progress that the cities have made during the last year and the problems they are facing, such subjects as limiting the expenditures of cities; financing the public schools; making the tax system more equitable, and the activities of municipal employes in advocating laws which increase the cost of government. Municipal health problems will be discussed at the afternoon session. Dr. Charles C. Duryee, of the state department of health, will present the results of the work he has been doing this year in scoring city health departments. City tax and revenue problems will be considered at the evening session. Senator Frederick M. Davenport will confer with the officials about the work of the joint committee of the legislature on taxation will do this year.

On the second day the officials will discuss the various plans which have been suggested for the solution of the traction problems in the cities of the state. A symposium on problems which the various cities have under consideration will be held in the afternoon.

Schenectady will entertain the officials at a dinner in the evening at which the speakers will be senator Clayton R. Lusk, of Cortland, and Governor Alfred E. Smith. Senator Lusk, who is chairman of the joint committee of the legislature now investigating seditious activities in this staate, has been asked to tell the cities how they can help the state to stamp out Bolshevism. Governor Smith will discuss "The State and Its Municipalities."

Suggestions to insure the collection of delinquent taxes will be discussed at the last session. The discussion will be led by mayor William J. Wallin, of Yonkers.

The City Clerks' Association will meet here at the same time. Plans have been made for both organizations to hold three joint sessions.

National Municipal League.

The secretary of the National Municipal League, Clinton Rogers Woodruff, has announced that he would not be a candidate for re-election to that office. In his letter on the subject addressed to the president, Lawson Purday, he says:

On May 28th next I shall have completed twenty-five years of service as secretary of The National Municipal League. Elected at the first meeting held in New York City, I have served continuously ever since. During this period the movement for higher municipal standards and democratic city government has developed to a point where a larger share of my time and attention is required than my other interests will permit me to give. I am therefore reluctantly forced to the conclusion that I must retire, so I hereby give notice that I shall not be a candidate for re-election to my present position.

I am not unmindful of all that this means in the severance of ties of a quarter of a century, but the work has become such that it must be regarded as calling for the time and efforts of one who may be regarded as professionally equipped and who will look upon it as his sole life work. This I cannot afford to do.

In taking this action it is not necessary for me to say that I shall not be giving up my interest in this work which is now more vitally important than ever, but simply pass on its active management to one who will be able to give it his undivided attention. It may sever my official relations with you and our colleagues; it cannot change my affection and respect for those who have borne the burdens of the days during that period of our history in which the National Municipal League has become a factor of no mean proportions in redeeming American Municipal Government from the indictment under which it rested and from which in many places it has not yet been relieved.

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI NEW YORK, MAY 31, 1919 No. 22

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 8, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 8, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9691
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Editorial Notes 379
Septic Tank Patent Settlement—Something New in Sewage Treatment.

Oil Construction for Oakland's Streets (Illustrated)..... 380
How and why that city uses oil for bituminous concrete and for surface treatment of old macadam are described by **Charles W. Geiger.**

Municipal Powers as to Garbage..... 382
Court decisions as to the rights of cities to prevent collection by any except designated collectors. By **John Simpson.**

Insect Aid to Filtration..... 383
Tells of certain insects that prevent ponding on several sprinkling filters in England.

Home Buying in Detroit..... 384
How one corporation aids in promoting this.

Federal Aid Road Act Regulations..... 385
Latest advices from the Bureau of Public Roads.

Calcium Chloride in Connecticut..... 386
The state superintendent of highways repairs tells of experience in that state.

McPherson's Electric Department..... 387

Pennsylvania Highway Bridges..... 387

City Maps 387

The Engineer in Politics..... 388
Arguments in favor of his taking a part in them, by the county engineer of Cuyahoga County, O., **W. A. Stinchcomb.**

Proposed Schedule of Engineers' Salaries..... 389
As adopted by Chicago Chapter of American Association of Engineers.

The Week's News..... 390

Legal News—Notes of Recent Decisions..... 394

News of the Societies..... 395

Industrial News 396

Personals 396

Contract News 19

SEPTIC TANK PATENT SETTLEMENT.

In 1916 the National Septic Process Protective League was organized by cities and other corporations and individuals which were threatened with suit for infringement of septic tank patents, there being more than two hundred members of the league at present. On the 24th of last month the organization accepted the offer of the Cameron Septic Tank Company, owner of the American patent, by the terms of which the league pays five thousand dollars to the company, which in turn will release each member of the league from "any and all claims of infringement, damages, profits, or otherwise, arising in any manner under the Cameron patent." As five thousand dollars is less than the cost of taking through the courts the one infringement suit that the league is now defending (that against Shelbyville, Ky.), the attorney of the league advised acceptance of the offer, although he felt confident of winning the suit.

This does not necessarily mean the end of septic tank litigation in this country, for there are undoubtedly some users of septic tanks that are not members of the league, and this agreement applies only to such members. But the settlement includes claims aggregating a quarter of a million dollars, and probably most of the cities or institutions which operate septic tanks and which are of any considerable size have joined the league; and it seems quite probable that there is left for the company only small pickings in the way of possible royalty collections.

SOMETHING NEW IN SEWAGE TREATMENT.

Information concerning two methods of treating sewage was given in last week's issue, and a third article on the subject appears this week which gives some new ideas on an old type of plant. These are proof that the last word in sewage treatment has not been said, by any means. They also indicate the diversity of methods now available, since one of the three methods described was mechanical, one was chemical and the third was biological.

Fine screening and acid treatment have been described in this journal several times, but the action by insects described this week is a matter concerning which little has been published. The term "biological," of course, applies to the action of any animal or vegetable organisms in reducing sewage matters, but we commonly think of bacteria in this connection. However, animal life has frequently been observed to play a part in sewage treatment. For instance, a species of earth worm was found to be abundant in slate filters, living upon the organic matter deposited upon the slates. Flies of a certain species abound in myriads on most sprinkling filters and their larvae undoubtedly live on some of th

matter deposited on the stones. Whether or not they produce any beneficial effect on the action of the filter has not, we believe, been made the subject of any special investigation.

The insects referred to in this week's article, however, apparently prevent the collection of deposits on the stones of sprinkling filters, and thus prevent ponding and the necessity of cleaning the filter media at intervals, whether or not they increase or decrease the total amount of unoxidized organic matter in the effluent. The vast numbers in which they develop under favorable conditions is indicated by the fact that there were collected from the walks around one small filter, 133 two-gallon buckets of insects, each only about 2 mm. long, or approximately five hundred million of them.

Not the least interesting fact, especially to the attendants at sprinkling filters, is the belief that these "spring-tails" devour the larvae of the filter fly, since the two are not found together in any numbers in the same filter. It seems to have been demonstrated that filters can be seeded with the "spring-tail" or *Achorutes*, and if further investigation does not develop disadvantages offsetting the apparent advantages, attempts may be made to domesticate this insect on this side of the Atlantic.

OIL CONSTRUCTION FOR THE STREETS

Surface Treatment of Old Water-bound Macadam—New Oil-bound Macadam—Conditions Under Which Each Is Used——Financial and Other Advantages of the Use of Oil.

By CHARLES W. GEIGER.

All new residence streets in Oakland, California, are now being built with an oil-macadam surface, and as rapidly as possible the city is resurfacing with oil and screenings such water-bound macadam streets as are not too far worn. The change from water-bound macadam was brought about chiefly by the wear of automobile traffic and the washing of hilly streets. From 25 to 35 miles of streets are treated with oil and screenings each year, and since 1911 the mileage of water-bound surface has been reduced from 254 miles to 12 miles, and this remaining twelve will probably be surfaced this year. This finished, the city will start on the reconstruction of the older oil-macadam streets, of which there are now about 100 miles.

The use of oil in construction and surfacing has greatly reduced the dust nuisance, and has enabled the city to save $80,000 a year in its street sprinkling expenses. The cost of sprinkling the water-bound macadam in 1910-1911 was $86,613, which has gradually fallen, as the mileage was reduced, to only about $7,000 this year. When the mileage was greatest, a maximum of 58 street sprinklers were used, but with the mileage reduced to 12, there are only four sprinklers. Had there been a large mileage of water-bound macadam last summer, when there was a water famine, it would have been impossible to keep the streets damp enough to prevent raveling.

In addition to the saving in sprinkling cost, it is estimated that the use of oil has made a saving in repair and cleaning costs of nearly $50,000 a year. This $130,000 saving is equivalent to about $540 a mile.

Aside from this saving, oiling has secured greater comfort and convenience to the citizens, which has resulted in constant demands for extension of the oil treatment into all parts of the city, which are granted as rapidly as funds will permit. In selecting streets for priority of treatment, those are taken first that will show the greatest saving from treatment, such as those that are being worn by automobiles or washed out by rains because of their steep grade. Also, streets are not surface-treated if they have worn out too much, for treating such streets would be largely a waste of money. Such streets are generally reconstructed. This surface treatment is looked upon as a maintenance measure and is paid for from maintenance funds.

Where the traffic is heavy, the surface treatment is not considered sufficiently durable, such streets including all in and near the business district and some of the main thoroughfares.

SURFACE TREATMENT.

The best results from surface treatment are obtained by the following method: The street is first repaired and rolled to obtain a uniform surface, then thoroughly swept with a rotary broom to remove all loose rock and dirt, then oiled with from ¼ to ½ gallon of road oil to the square yard, then covered with clean screenings and thoroughly rolled. This work is generally done in the winter time, as it is about the only kind of work that can be performed during the rainy season; applying the oil, however, is done only on dry days.

For the purpose of making these repairs, the city is divided into four districts, each under a deputy, who has two sub-foremen and the necessary laborers and carts.

A description of the work done last winter on twelve blocks of 14th street will give an idea of the general method of carrying on this work. This street had not been repaired for about 7 years. It contains a double-track street car line, and the street car company followed the city workmen, repairing between the rails and for two feet outside.

A sub-foreman, 4 laborers, 2 12-ton steam road rollers, a horse-drawn sprinkler and a one-horse cart were used for repairing and rolling the street. The crew worked up one side and down the other; but where there are no tracks the work is carried on the entire width of the street.

Macadam stone was dumped in piles and spread by four laborers, all holes being filled to grade. A 12-ton roller was then run over it until it was pressed solidly into the road surface. About 200 feet were so treated at a time, being a half-day's work. About an hour was required for the rolling. Screenings were then spread evenly and rolled for a short time, well soaked by a horse-drawn sprinkler, and rolled until thoroughly compacted. About two cubic yards of screenings were used for every five cubic yards of rock, or 80 cubic yards for 5,000 square yards. As soon as the rolling was completed, traffic was permitted on the street.

Each roller is equipped with a storage tank holding 158 gallons of oil, sufficient for two days' operation, and these are filled every other day by an oil supply wagon. The oil supply wagon carries a duplex pump, which is connected to the boiler of the steam roller by means of a hose. The pump forces the oil into the storage tank of the roller through another hose.

At the close of work on Saturday the roller is run near to a fire hydrant, and on Monday morning the engineer

OILED SURFACE IN FOREGROUND, SCREENINGS IN GUTTER, SCREENINGS SPREAD BEYOND GUARD.

connects the boiler to the hydrant by means of a 50-foot length of hose and washes out boiler. This hose is carried on a reel enclosed within a cylinder that is bolted to the roller, out of the way of the engineer. The upper half of the cylinder is hinged to the lower, and the cylinder is kept locked when the hose is not in use.

After the screenings had been rolled in, the oil was

REAR OF ROAD ROLLER, SHOWING FUEL TANK AND HOSE.

distributed by means of a Ward atomizer. (The work so done is more successful than it was in 1910, when no adequate means of distributing oil were used). From ¼ to ½ gallon of oil per square yard was used, the exact amount depending on the judgment of the chief of street maintenance. On the 14th street work a crew of eight men was used in the oiling, a foreman, engineer, driver of oil wagon and driver of horse-drawn rotary sweeper used for thoroughly cleaning the surface before the oil was applied. This wagon distributed about 2,000 gallons, or twice its contents, in a day. The oil is applied at a temperature of about 300 degrees, being forced through the atomizers by a 6 h.p. gasoline engine operating at 375 r.p.m., direct connected to a rotary pump, which ejects the oil at a pressure of 50 lbs. The pump draws the oil from the oil wagon through a 4-inch suction pipe, and a 1½-inch hose returns it to the tank when spraying is discontinued temporarily, the pump not being stopped.

Immediately after receiving the oil, the road was covered with screenings, which had been distributed along the gutter by a truck before the oiling began. The screenings were rolled as soon as spread.

NEW PAVEMENT.

Oil macadam pavement, as now constructed, consists of a layer of stone 4 inches thick at the gutter and 5 inches at the crown, measured before rolling; on which, after being compacted, is placed 3 inches of oiled wearing surface. A soft rock is permitted for the base course, and even encouraged, because it compacts better into a firm dense mass without injuring the subgrade by excessive rolling; but a high-grade, hard stone is required for the wearing surface.

The base course is thoroughly rolled and on it is spread three inches of top-course stone. This is oiled, harrowed, oiled again, and then covered with screenings and rolled. Any voids are then filled, more oil applied and covered with screenings, and a final rolling given. About ½ gallon of oil is used for each of the three applications.

In oil-macadam streets the gutters are constructed of concrete 6 inches thick and not less than 3 feet wide, or of broken stone, grouted, of the same dimensions. The curbs are either of concrete or of 3 by 12-inch redwood. The latter last for at least ten years and are usually replaced with concrete when worn out.

This class of pavement has given excellent satisfaction in most cases. Some of the streets recently constructed present the appearance of a sheet asphalt pavement. It is desirable to keep these pavements in as nearly perfect condition as possible. For this purpose there is an oil-patching crew equipped with a special machine, which not only repairs all breaks, but repairs over trenches cut in the street. The oil used can be kept in the machine at the proper temperature all day and is distributed by pressure through a flexible metallic hose. The labor and material used for patches are charged for in case the cuts

GETTING NEW STONE READY FOR OIL.

were made by public service corporations or private parties.

ATOMIZER ATTACHED TO REAR OF TANK.

MUNICIPAL POWERS AS TO GARBAGE.

Right to Require Citizens to Surrender Garbage to Municipal Collectors and to Deny the Right of Collection to Others.

By JOHN SIMPSON.

The following statement of the law on the subject of the power of municipalities in regard to the disposal of garbage has frequently been approved by the courts and is in harmony with the majority of the adjudicated cases: The removal and disposal of garbage, offal and other refuse matter is recognized as a proper subject for the exercise of the power of a municipality to pass ordinances to promote the public health, comfort and safety. The natural scope of an ordinance on this subjec tis confined to discarded and rejected matter; i. e., to such as is no longer of value to the owner for ordinary purposes of domestic consumption. If the matter in question has not been rejected or abandoned as worthless, and is not offensive in any way to the public health, it does not come within the natural scope of such an ordinance. Garbage matter and refuse are regarded by the decisions as inherently of such a nature as to be either actual or potential nuisances. By reason of the indifferent nature of the substance, it is therefore not a valid objection to an ordinance requiring disposal in a specified manner, that garbage has some value for purposes of disposal, and that the effect of the ordinance is to deprive the owner or householder of such value. That the owner suffers some loss by destruction or removal without compensation is justified by the fact that the loss is occasioned through the exercise of the police power of the state, and the loss sustained by the individual is presumed to be compensated in the common benefit secured to the public. 2. Dill. Mun. Corp. 5th ed. §678. The reasons put forward by the courts for these rules, and their application to various circumstances, with the few contrary decisions, will be found below.

An ordinance of the city of Omaha makes it a misdemeanor for anyone not employed by the city for that purpose to remove or haul any garbage through the streets or alleys; provides for the collection of garbage by city employees; requires every housekeeper, or occupant of any building, and the proprietor of any hotel, restaurant, cafe, and boarding house, to place all garbage in proper receptacles reasonably accessible to the garbage collector; and defines "garbage" to include "every refuse, accumulation of animal, fruit, or vegetable matter that attends the preparation, use, cooking, or the dealing in or storage of meats, fish, fowl, fruits, or vegetables."

King, the proprietor of a restaurant in the city, sold the waste from his kitchen to one Urbach, who hauled it beyond the city limits as feed for swine. They both sued to enjoin the city from enforcing the ordinance in so far as it prohibited anyone not employed by the city for that purpose from hauling garbage through its streets and alleys. The question presented was whether the enactment of the ordinance was a proper exercise of police power. The Nebraska Supreme Court, Urbach v. Omaha (1917), 101 Neb. 314, answered the question in the affirmative, holding on the authority of the earlier decisions, that under the police power of the city, garbage, as defined in the ordinance, may be treated as a nuisance per se.

The plaintiffs in the Omaha case further contended that the ordinance was void because it prohibited the owner of garbage from feeding it to fowl or animals on his premises. On this point, the court said that, whether this is a proper construction of the ordinance, and whether, thus construed, it is unconstitutional, were questions not necessary to a decision of the case. It was not shown that the plaintiffs had been prevented from making such use of the garbage. King complained because his right to sell garbage had been invaded, and the petition did not show that he did, or desired to, feed the garbage to fowls or animals on his premises. Urbach complained because the ordinance denied him the right to purchase and remove garbage produced on the premises of others.

Under a statute giving a city power to make regulations to secure the general health, to prevent and remove nuisances, and to compet and regulate the removal of garbage beyond the corporate limits, the Kansas Supreme Court holds, O'Neil v. Harrison (Kan. 1915), 150 Pac. 551, that the city may grant an exclusive right to the highest bidder to remove all garbage; the term being defined, in the ordinance authorizing the action, to mean "all rejected food and offal." The court said that it did not regard the mere fact that the city would derive some revenue from the measure as taking it out of the category of police regulations.

The regulations promulgated by the Commissioners of the District of Columbia for the collection and disposition of garbage, under the act of Congress of June 6, 1900, provide, as required by that act, for a disposition of all garbage by a reduction and consumption process, and in addition prohibit the removal and disposition of garbage by any one other than the garbage contractor, and also prohibit the transportation of garbage beyond the District for the purpose of feeding it to animals. In sustaining these regulations as a valid exercise of the police power, the Court of Appeals for the District of Columbia holds, Dupont v. District, (1902) 20 App. (D. C.) 477, that, although all matter which may be laid aside merely in the preparation of dishes for the table is not necessarily garbage, and, therefore, subject to the same regulation in all respects, still, when such matter is mingled with garbage it becomes likewise subject to public control, notwithstanding that in some instances the owners might be able to dispose of it for a price to persons willing to make use of it in its unreduced state as either animal food or fertilizer.

In City of Rochester v. Gutberlett, (1914) 211, N. Y. 309, the New York Court of Appeals held that it is within the power of a municipality not only to impose reasonable restrictions and regulations upon the manner of removing garbage, but also, if it sees fit, to assume exclusive control of the subject, and to provide that garbage and refuse matter shall only be removed by the officers of the municipality or by a contractor hired by the municipality, or by some single individual to whom an exclusive license is granted for that purpose. An exclusive right so created is not open to the objection that it is a monopoly. This was an action to enjoin an ordinance regulating the gathering of garbage, letting the contract therefor, and canceling all permits theretofore issued, at the instance of a farmer who, along with others, had collected garbage under licenses from the city. The court said that experience has shown that when there are many collectors of garbage within a municipality, acting independently although under license, it is difficult to maintain the supervision necessary to preserve the public health; while, with one contractor acting under a contract pursuant to which he is paid and for the faithful performance of which he is required to give a bond with sureties, the public health can be

and is better and more surely protected. In this particular case there was nothing in the ordinance to prevent the owner of a restaurant or hotel from removing the garbage, bones and kitchen refuse on his own property to a place where it would not be a nuisance to the public health, there to be fed to hogs or otherwise disposed of in such manner as to such owner might seem desirable.

A similar case to the above was State v. Orr (1896) 68 Conn. 101, when the court said that such an ordinance is not invalid as to one to whom a license or permit has been refused. The fact that all the garbage collected by him comes from certain restaurants, with the proprietors of which he has contracts for its removal, does not render the ordinance invalid as an interference with his contracts when it does not appear that the contracts were entered into before the adoption of the ordinance. Nor does the fact that the garbage collected by him is fresh, and some of it fit for food, render the enforcement of the ordinance, as to him, a deprivation of property without due process of law.

Similar ordinances have been sustained in the following cases: California Reduction Co. v. Sanitary Reduction Works (1905) 199 U. S. 306, affirming 126 Fed. 29; Gardner v. Michigan (1905) 199 U. S. 325; Walker v. Jameson (1894) 140 Ind. 591; State v. Payssan (1895) 47 La. Ann. 1029; Ouray v. Corson (1900) 14 Colo. App. 345; Re Vandine (1826) 6 Pick, (Mass.) 187; Grand Rapids v. De Vries (1900) 123 Mich. 570; Iler v. Ross (1902) 64 Neb. 710; State v. Robb (1905) 100 Me. 180; Ex parte London (Tex. 1914) 163 S. W. 968; Ex parte Howell (Tex. 1913) 158 S. W. 535; Atlantic City v. Abbott (1906) 73 N. J. L. 281; Coombs v. MacDonald (1895) 43 Neb. 632; Smiley v. MacDonald (1895) 42 Neb. 5.

But in Knauer v. Louisville (1898) 20 Ky. L. Rep. 193, 45 S. W. 510, an ordinance of this kind was held unreasonable and confiscatory.

Although an early Pennsylvania case, Kussel v. City of Erie (1898) 8 Pa. Dist. 105, held that an ordinance prohibiting, under penalities, persons who had not contracted with the city from removing garbage, was invalid because in restraint of trade, and because it deprived citizens of their property without due process of law, later Pennsylvania cases hold that cities authorized by statute to make regulations to secure the general health and to remove and prevent nuisances, may by ordinance provide for contracts for the exclusive right to remove garbage and prohibit others from doing so under penalty. Butler Borough v. Logan (1910) 19 Pa. Dist. 952; Harrisburg v. Martin (1909) 20 Pa. Dist. 325; Marple v. Pfanner (1911) 21 Pa. Dist. 851.

In Smith v. City of Spokane (1909) 55 Wash. 219, it was held that a city ordinance which created a crematory department, and made it unlawful for any persons other than the employes of that department to convey garbage through the city streets, is a lawful exercise of the police power in the interest of the public health, though it destroys the business of persons who had previously been engaged in hauling garbage. To the same effect are the cases of Schultz v. State (1910) 112 Md. 211, 76 Atl. 592; Nash v. District of Columbia (1907) 28 App. Cas. (D. C.) 598; Atlantic City v. Abbott (1906) 73 N. J. L. 281, 62 Atl. 999; Board of Health v. Vink (Mich. 1915) 151 N. W. 672; Ex parte London (1914) 73 Tex. Crim. 208.

The California Supreme Court holds, Ex parte Zhizhuzza (1905) 147 Cal. 328, that a city with charter power to regulate business that may endanger the public safety, health, and comfort had power to pass an ordinance providing that the city should have the exclusive right to remove garbage, and imposing a small fee for its removal, recoverable by civil action.

Ohio has a statute (Gen. Code, Sec. 3649), authorizing municipalities to provide by ordinance for the collection and disposition of sewage, garbage, dead animals, etc., and to maintain and regulate plants for the disposal thereof. It has been held that under this section a municipal corporation may grant a monopoly for removing and making use of the dead bodies of animals which have not been slaughtered for food. Stadler v. Cleveland, 4 O. N. P. (U. S.) 649, 17 O. D. (N. P.) 340. On the other hand it has been held that an ordinance which forbids the transporation of any dead animals, fish or garbage, including condemned human food, through the streets of a municipal corporation by any person except the city contractor or his agent, is invalid, as in violation of the 14th Amendment of the Constitution of the United States. Bauer v. Casey, 6 O. C. C. (U. S.) 69, 16 O. C. D. 598.

Illinois has a statute providing that any city having a population of more than 100,000 may make contracts for more than one year and not exceeding five years, relating to the collection and final disposition of garbage and ashes. (Hurd's St. Ch. 24, section 623).

INSECT AID TO FILTRATION

On Several English Percolating Filters Ponding Is Entirely Prevented by the Achorutes —Results of Investigations and Experiments.

It having been learned by H. D. Bell, manager of the corporation sewage works at Stratford-on-Avon, that it is possible to remedy ponding on sewage filters by the growth therein of *Achorutes Viaticus*, Dr. W. H. Parkinson and Mr. Bell investigated the subject and report that they have established the fact that these insects destroy the collodial matter which is a common cause of ponding.

The insect named is purplish in color, about 2 mm. long when full-grown, and lives on and in decaying animal or vegetable matter. It belongs to the family *Poduridae* of the *Collembola* or "spring-tails." On sewage beds their chief food supply seems to be the slimy colloidal growth which forms on any rough surface with which sewage stands in contact and which the *Achorutes* attack with avidity and destroy. They are also known to feed upon the larvae of the sewage fly, which is such a nuisance at filter plants, and apparently the fly never is found in any numbers where the insect abounds.

The investigation by Bell and Parkinson was described in detail by the latter in recent issues of "Municipal Engineering and the Sanitary Record" of England, from which we summarize the following conclusions and results:

Mr. Bell reported that the Stratford filters, which are percolating or sprinkling filters of which clinkers form the media, had not been cleaned or even raked or forked since February, 1910, during which period the filters have passed about 1,500 million gallons of sewage. During this time the *Achorutes* abounded in the interstices of the filters. Also in summer, when they were present in the largest numbers, the beds were the cleanest, occasionally becoming dirty in winter, ponds three or four feet in diameter sometimes appearing.

They were first noticed on one of the eight beds, which was clean, while the other seven were ponding rapidly. A bucketful (about two gallons) of the insects was obtained and placed on one of the dirtiest filters, and in about three days the clinker in this was clean at the

surface and for one or two inches below. Nineteen bucketfuls of the insects were then placed on each of the filters, 133 bucketfuls in all. Ponding on all ceased within a week, and recurred less and less frequently for a few years, finally ceasing altogether.

The investigators reared some *Achorutes* from eggs, which hatched on about the 28th day after being laid. They endeavored to innoculate filters at other cities with the insects, but they apparently died out. These efforts were made with insects only. They then placed on the filters slag covered with slime rich in the insects and undoubtedly containing innumerable eggs, thinking that the newly hatched insects might become acclimated. This apparently happened, for those filters soon became full of the insects and cleaner than they had ever been before.

In order to determine the precise extent of the beneficial effect, two glass tubes 1¾ inches in internal diameter and 4 feet long were filled with filter media and arranged so as to admit tank effluent above and withdraw the liquid from the bottom. The tank effluent was dropped onto the surface of the media as from a spray. The cinders placed in the tubes were first sterilized and graded as to size. These two small filters were operated under exactly identical conditions, except that *Achorutes* were placed in one tube but were absent in the other. Each tube was examined daily. Fresh tank effluent was placed at noon daily in the tank that fed these filter tubes.

One of the noticeable features of the experiments was the large amount of suspended matter in the effluents after the rest periods, and that this amount was much greater from the tube containing *Achorutes*. Dr. Parkinson suggests that either "the *Achorutes*, in the act of feeding, detach more of the colloidal matter than they can consume; or that the suspended matter consists of the faeces of the insects; or that they, in the act of feeding, detach certain particular portions of the colloidal growth, which apparently prevents the remaining portions from re-forming together, and therefore the latter are more easily attacked by oxidizing and nitrifying agencies, passing out of the filter in oxidized humus.

"This humus passes out from the filter in masses, from time to time, and is not *generally* passing out in small portions *all* the time. For instance, the first discharge of effluent from a filter after rest always contains a large portion of suspended matter, and also a large amount of nitrate. The diminution of suspended matter in the effluent, as the filter continues at work, is much more marked than the nitrate result, the latter settling down to 1.0-1.5 parts per 100,000 nitric nitrogen within forty-eight hours, whereas the suspended matter becomes normal in less than twelve hours."

From the experiment the investigators drew the following conclusions:

"It is demonstrated that of two filters which are otherwise exactly similar and operating under precisely the same conditions, a very great advantage is possessed by that filter which contains the *Achorutes* over that which does not contain them. This advantage exists under widely different external conditions, and it is also proved to be independent of the concentration of the sewage. The fact that ponding does not occur means that a given filter can be operated at a much greater rate of flow, so that less filter capacity will deal with the same amount of sewage; it also means that the labor required for the cleaning which would otherwise be necessary, and the delay resulting therefrom, can be largely done away with. It is thus claimed that filters containing *Achorutes* should give rise to an increased economy in the operation of sewage works."

HOME BUYING IN DETROIT.

By JAMES H. COLLINS.

Recent estimates indicate that 40,000 new families have been added to Detroit the past year, but that only 10,000 new houses have been built, leaving 30,000 families of the new population to shift for quarters.

To aid its employes in acquiring their own homes, the American Blower Company of Detroit, Michigan, has organized an advisory and financial service in its welfare department. Officials of this concern occasionally talk to employes on the economy and value of acquiring homes, giving practical suggestions as to how to go about purchasing a lot and building a house. This is an outgrowth of the savings and investment movement resulting from war finance experiences. It is laid down as a general proposition that any married employe earning $25 a week is in a position to invest $3,300 in a cottage and lot, and that this will be cheaper than average Detroit rents, as well as give better living quarters and independence.

Speaking recently to employes of that plant, the secretary of the company explained the financing of a home. If an employe owns an $800 lot or has that sum in savings with which to buy one, it is possible to build a $2,500 cottage on it. The first step is to select the lot, if one has not already been purchased; and as location is important in determining mortgage value, the company advises that employes confer with the secretary of the "Society for Savings," a Detroit thrift institutiton. Through experience in real estate, this official is able to suggest locations, and very often save money on the price.

The next step is securing a loan for building. The "Society for Savings" will lend sixty per cent of the total value of house and lot. The lot being $800 and the house $2,500, this yields $1,980 on a mortgage. Before building can start, it is necessary to borrow $520 additional, and this is loaned by the American Blower Company. One mortgage covers the whole transaction, as the "Society for Savings" issues the mortgage for $2,500, and the company pays the additional $525 into that institution. Care is taken to make clear to employes that this is not benevolence on the company's part, because the "Society for Savings" issues certificates of deposit to the company for its money, and these certificates pay five per cent interest.

The savings institution supervises the letting of the contract and the building of a house, in which experience in construction matters usually results in economies to the home purchaser. When the home is finished and the owner has moved in, he begins monthly payments equivalent to one per cent of the mortgage—on such a transaction this is $25 a month, usually no higher than the rent he had been paying, and in some cases decidedly less. The owner also pays taxes and insurance and keeps his home in repair, but to offset these expenditures there is an increase in value from year to year. Moreover, such a house purchased ready built in Detroit is today estimated to cost from $500 to $1,000 more, representing builder's profits, selling expenses and other costs that accumulate where the purchaser of a home neglects to do his own planning and financing.

This is possible under the construction loan plan followed in such a case, whereas the planning and building of a house under ordinary mortgage conditions would require that the owner pay for both lot and house before money could be borrowed on ordinary mortgage. The same general plan applies to the worker with smaller savings, but a minimum of $300 is set as the limit of value of a lot as the basis. The company's motive in

this work is to help employes relieve the almost intolerable housing conditions in Detroit, and also to make its employes permanent as far as possible.

FEDERAL AID ROAD ACT REGULATIONS.

Latest Regulations Prepared by the Office of Public Roads for Carrying Out This Act as Recently Amended.

The Bureau of Public Roads has prepared the following memorandum relative to the Federal Aid Road Act, as amended, and the regulation for carrying it out. These are effective from March 8, 1919.

ROADS ENTITLED TO AID.

Subject to the opinion of the solicitor of the Department of Agriculture as to the status of any particular road, any public road that comes within any of the following classes is eligible for federal aid.

1. Any public road a major portion of which is used for the transportation of the United States mails at the time the application for Federal Aid is made (the major portion may consist of a single stretch of road or several parts); or

2. Any public road which can, by reasonable construction or improvement in co-operation with the state authorities, be put into such condition as to permit the use thereof for transporting the United States mails; or

3. Any public road no part of which is used for the transportation of the United States mails at the time the application for Federal Aid is made, provided it is not more than ten miles in length and forms a connecting link (cross link) between two roads used for transporting the United States mails at the time such application is made; or

4. Any public road no part of which is used for transporting the United States mails at the time the application for Federal Aid is made, provided it does not exceed ten miles in length and connects the end of a road with the beginning of another road over both of which the United States mails are being transported at the time of such application.

The following are the regulations of the secretary for carrying out this act:

Regulation 4. Project Statements.

Section 1. A project statement shall contain all information necessary to enable the Secretary to ascertain: (a) whether the project conforms to the requirements of the Act; (b) whether adequate funds, or their equivalent, are or will be available by or on behalf of the state for construction; (c) what purpose the project will serve and how it correlates with the other highway work of the state; (d) the administrative control of, and responsibility for, the project; (e) the adequacy of the plans and provisions for proper maintenance of roads; and (f) the approximate amount of Federal Aid desired.

Section 4. Each project statement shall be accompanied by a sketch map, showing the location of the proposed project and all main contiguous transportation features.

Section 5. Where any part of the cost of a project is to be furnished by a county or other local subdivision or subdivisions of a state, the project statement shall be accompanied by a certified copy of each resolution or order. if any, of the appropriate local officials respecting the funds which are or will be made available, or respecting the supervision of the construction of the road and of the expenditure of the money provided or to be provided for paying such cost.

Regulation 5. Surveys, Plans, Specifications and Estimates.

Section 1. Surveys and plans will show in convenient form and sufficient detail, according to accepted engineering practice, necessary data, in connection with the specifications and estimates, to enable the Secretary to ascertain and pass upon location, grades, drainage, bridges, other structures, special and unusual features, the work to be performed, and the probable cost thereof, all in conformity with the standards governing form and arrangement prescribed by the Secretary, except that state standard specifications submitted and approved proir to July 1, 1919, need not conform to the standards prescribed by the Secretary; and such approved state standard specifications may continue in force after July 1, 1919, so long as they remain unchanged.

Section 2. Specifications shall set forth the proposed method of construction, type of construction, materials to be used, and other essentials, in such detail as to afford complete knowledge of all steps to be taken in the construction of the project.

Section 3. The estimate for the proposed type, or types, of construction for each project shall show the estimated quantity and cost of each item of construction in detail and, separately, the ten per cent fund, and shall not include any expense of advertising.

Section 4. Unless state standard contract and bond forms have been approved, there shall be submitted, with each set of specifications, for the approval of the Secretary, copies of the form of contract, together with all documents referred to therein or made part thereof, and of the contractor's bond which it is proposed to use on the project. No alteration of such form shall be made until it is approved by the Secretary.

Section 5. Rights-of-way necessary for any project shall be provided, and any incidental damages to adjoining property due to construction work paid, by or on behalf of the state, and the expense thereof shall not be included in the estimate or paid in any part, directly or indirectly, by the Federal Government.

Section 6. Grade crossings shall be avoided where practicable. The estimated cost of eliminating a grade crossing shall not include any amount the state, county or other civil subdivision has received, is to receive, or is entitled to receive, directly or indirectly, as reimbursement or payment from the owner of a public utility, for or on account of such elimination.

Section 7. No part of the expense of making surveys, plans, specifications or estimates, by or on behalf of the state prior to the beginning of construction work, shall be included in the estimate or paid by the Federal Government.

Section 8. When plans, specification and estimates have been approved by the Secretary, no alteration thereof shall be made without his approval, except that minor alterations which will not involve an increase in the cost of the project to the Federal Government may be made with the approval of the Director of the Bureau of Public Roads, or of his authorized representative.

Regulation 6. Project Agreements.

Section 1. A project agreement between the State Highway Department and the Secretary shall be executed in triplicate on a form furnished by the Secretary. No payment shall be made by the United States unless or until such agreement has been executed. nor on account of work done prior to the recommendation by the District Engineer of the Bureau of Public Roads that the project plans, specifications and estimates be approved.

Regulation 7. Contracts.

Section 1. No part of the Federal money set aside on account of any project shall be paid until it has been shown to the satisfaction of the Secretary that adequate means, either by advertising or by other devices appropriate for the purpose, were employed, prior to the beginning of construction, to insure the economical and practical expenditure of such money.

Section 2. Immediately on publication of advertisements, copies thereof shall be furnished to the Bureau of Public Roads.

Section 3. Bids shall conform to the standard proposal form and the items shall be the same as those contained in the estimate provided for in Reg. 5, Sec. 3.

Section 4. Copy of the tabulated bid prices, showing the unit prices and the totals of each bid for every project, shall be furnished promptly to the Bureau of Public Roads.

Section 5. In advance of the acceptance of any bid, sufficient notice of the time and place the contract is to be awarded shall be given to the Bureau of Public Roads to enable it, if it so desire, to have a representative pres-

ent. When a bid has been accepted, prompt notice thereof shall be given to the Bureau of Public Roads.

Section 6. If the contract be awarded to any other than the lowest responsible bidder, the Federal Government shall not pay more than its pro rata share of the lowest responsible bid, unless it be satisfactorily shown that it was advantageous to the work to accept the higher bid.

Section 7. A copy of each contract as executed shall be immediately certified by the State Highway Department and furnished to the Bureau of Public Roads.

Section 8. The specifications and plans shall be made a part of the contract.

Section 9. No alteration in such contract shall be made without the approval of the Secretary.

Regulation 8. Construction Work and Labor.

Section 3. Unless otherwise specifically stipulated in the project agreement, bridges, viaducts and underpasses shall have clear width of roadway of not less than 16 feet, and clear head room of not less than 14 feet for a width of 8 feet at the center.

Section 4. No part of the money apportioned under the Act shall be used, directly or indirectly, to pay, or to reimburse a state, county or local subdivision for the payment of, any premium or royalty on any patented or proprietary material, specification, process, or type of construction, unless purchased or obtained on open actual competitive bidding at the same or a less cost than unpatented articles or methods equally suitable for the same purpose.

Section 5. The supervision of each project by the State Highway Department shall include adequate engineering and inspection throughout the course of construction.

Section 8. Force account work, or other labor, teams, material and equipment furnished by or on behalf of the State Highway Department on construction work shall be used only on such terms and conditions as are set forth in the project agreement.

Regulation 9. Records and Cost Keeping.

Section 1. Such records of the cost of the work, and of inspection and tests by or on behalf of the state, shall be kept by or under the direction of the State Highway Department, as will enable the Secretary, or his authorized representative, at any time to determine the condition of the construction and maintenance of, and the cost to the state and the Federal Government of the construction work and labor done on any project.

Section 2. The accounts and records, together with all supporting documents, shall be open, at all times, to the inspection of the Secretary or his authorized representative, and copies thereof shall be furnished when requested.

Section 3. Certified copies of payrolls on force account work and of all vouchers for other expenditures shall be furnished, whenever requested by the Secretary or his authorized representative.

Section 4. Whenever requested by the Secretary or his authorized representative, unit costs on any project shall be kept, on forms furnished by the Bureau of Public Roads.

The general method of procedure is as follows: A piece of road is selected for improvement which is a state road and which also is within the classification of The Federal Aid Road Act. An engineer for the state is sent to make a preliminary investigation on which to base an approximate estimate of the proposed work. A project statement and estimate is made out and submitted to the Bureau of Public Roads for approval. An engineer of the U. S. Dept. inspects the location as to the proposed work and also as to the status of the road as a postal route. Upon approval by the United States of the Project Statement, final surveys, cross sections and plans for the proposed work are made and an estimate of the cost. These are submitted to the U. S. Department and, upon approval, a project agreement or contract is signed by the Secretary of Agriculture for the United States and by the State Highway Commissioner for the state. The work is then advertised and contract let. By the cooperation of the U. S. District Engineer's office, time has been saved by having the preliminary investigation made by the State and Federal Engineers together.

Attention may be called to the following points:

The improvement must be of a substantial character.

The maintenance must be kept up by the state and county to the satisfaction of the United States on all Federal Aid roads.

The engineering information must be accurate and complete and cover all details.

When a county sets aside a certain amount of county funds to assist the state in meeting the Federal Aid funds, a certified copy of the resolution of appropriation in duplicate must be sent in to the State Highway Commission to be filed with the project statement.

CALCIUM CHLORIDE IN CONNECTICUT.

Experiences with Its Use in That State, as Described by the Superintendent of Repairs of the State Highway Commission.

Calcium chloride has been used in Connecticut as a dust preventative on gravel roads and has proved very satisfactory for this use, according to W. Leroy Ulrich, superintendent of repairs of the Connecticut State Highway Commission. He is quoted by the Bureau of Public Roads, in a recent publication, as stating that "the results obtained with several types of gravel roads under various climatic and traffic conditions, while differing considerably, have in each case justified its use."

He describes at some length the method of applying the material, which description we abstract in the following paragraphs:

The road to be treated should be kept in shape by use of a drag for about two weeks previous to the application of the calcium chloride. The material may then be applied by spreading with shovels, but this he considers too slow and expensive and unsatisfactory in the uniformity of distribution obtainable. An ordinary lime sower can be used, but he considers it more economical to purchase a special machine for the purpose, such as one having a double set of agitators and an adjustable opening to regulate the amount delivered. Such machines may be purchased in different widths adapted to use with either a single horse or a pair.

Where horse spreaders are used, the drums are distributed along the road at such regular intervals as is determined by the rate at which the material is to be applied. For instance, using a machine that spreads ten feet, two drums are distributed every 220 feet. (A drum holds 350 pounds). The machine is then run up one side 220 feet, down the other side, and then up the middle, ending at the next drums, whose contents are then placed into the distributor. This gives a little less than one pound per square yard on each side of the road and nearly two pounds on the center ten feet; this distribution having proved more satisfactory than uniform distribution over the entire surface.

Ordinarily about one and a half pounds per square yard is used for the first application and one pound for the second; the interval between applications depending upon the quality and condition of the road surface and the character and volume of traffic. For good surface, two applications per year will suffice under moderate traffic, but three may be necessary under heavy traffic. The best results are obtained by spreading the material after a rain, while the road is wet.

Instead of distributing the drums, the distributor may be hauled behind an automobile truck carrying say eighteen drums which will weight about three tons. The distributor can then be run continuously in one direction for about 6,200 feet before refilling the truck, and make three trips over this length, as described before.

All workmen employed in handling the material should wear rubber boots, as the chemical action of the chloride is very detrimental to leather. Cotton gloves are desir-

able to prevent the hands from becoming sore. The hoofs and hocks of the horses that work the distributor should be cleaned and greased night and morning. After the chloride has liquified and been absorbed by the road it will not injure horses or automobile tires.

The cost of application in Connecticut in 1918 was 3.1 cents per square yard per year for two applications, 2.6 cents being for chloride and one-half cent for handling and application, labor receiving approximately $2.75, teams $7.50 and three-ton trucks $75. For an 18-foot road this gives $327 a mile.

While not considered as a binder, calcium chloride makes the road less liable to ravel. On account of the moisture held in the surface by the material, dragging can be done without waiting for a rain, and light dragging at intervals will maintain an excellently smooth surface. After two or three years of treatment it is found that the road settles into condition more rapidly after the spring thaw than untreated roads.

McPHERSON'S ELECTRIC DEPARTMENT.

Extensive Use of Current for Cooking—Recent Extensions to Plant—Financial Statement.

The city of McPherson, Kan., which has been under the commission form of government since January, 1914, owns its own water and electric light plants, which are operated by the water and electric department, of which C. F. Rasmussen is superintendent.

The street lighting system at the end of 1918 consisted of three hundred and twenty-five 80 c.p lamps, type C, and forty 2-light standards carrying 100 c.p. lamps, type C. The parks are lighted with 1-light and 2-light standards supplied by underground cable. New equipment for the electrical plant was purchased in 1917 and was put into operation in December, 1918. A new Skinner "Uniflo" engine was tested out and demonstrated remarkable efficiency for a non-condensing engine; but it was found that the new boiler was not adapted to the kind of fuel used by the city, and it has to be reconstructed.

The inventory of the resources of the electrical department gives the value of the pole lines as $21,283; steam equipment, $28,541; electric equipment, $8,390; series tungsten lines, $4,592; electric meters, $9,108; real estate, $632. Bonds and certificates to the amount of $5,500 and a bank balance of $1,972.56 on January 1, 1919, together with other equipment, fuel on hand, etc., give a total of $88,424. This amount was increased during the year 1918 by $6,009. The department pays interest on the bonds, which amounted to $1,364 last year. The total expense for the year, including insurance, advertising, interest and all operating and maintenance expenses, and including the purchase of the new steam and electric equipment and a new smoke stack at a cost of $15,095, totaled $44,910.

The income included $18,590 for residence lighting, $9,803 for commercial lighting, $1,502 for cooking, $2,679 for power, $286 for lighting signs, $1,518 for street lighting, and $1,995 for pumping. Of the total output, 23.29 per cent was used for residence lighting, 16.30 per cent for pumping, 13.58 per cent for power, 11.14 per cent for street lighting, and 8.95 per cent for cooking. The line and transformer loss between the customers' meters and the main meter was 23.66 per cent of the current sent out.

The use for cooking is larger than in the majority of cities, we believe. In 1908 there were fifty-one customers using electricity for cooking, the amount of current used per month by the individual parties varying from a minimum of 11 to a maximum of 289 k.w.h., with bills varying from the minimum of $1 to a maximum of $12.62 per month. The rate for cooking is four cents for the first 50 k.w.h. and three cents for all above that, with a minimum charge of $1 per month. While these figures are given as the expenditures for cooking, it is explained that they do not accurately represent the cooking cost, but are rather the cost of all devices using current except lamps, all such devices being at the same rate and measured with the same meter.

The town of Galva, seven miles east of McPherson, has constructed a steel pole transmission line to McPherson for the purpose of obtaining current from the McPherson plant. The current will be transmitted at 6,600 volts, being sold to Galva wholesale, and retailed by that city to its inhabitants.

PENNSYLVANIA HIGHWAY BRIDGES.

The State Highway Department of Pennsylvania will open bids on June 19th for forty-three bridges, to be located in eleven counties, which will be amply strong to carry the heaviest motor trucks. It will thus take an appreciable step toward remedying a condition that was shown, in our issue of April 19, to exist in all states—a very considerable percentage of unsafe bridges.

All of these bridges are to be of reinforced concrete of the slab type, with a roadway 24 feet wide in the clear, and parapets sufficiently high and strong to prevent automobiles going overboard. Ten have 12 feet span, five have 10 feet, five 8 feet, four 16 feet, four 20 feet, four 30 feet, three 24 feet, two 6 feet, two 4 feet, and one each of 5, 14, 18 and 28 feet.

While the spans are not long, they are in many cases longer than those of the bridges which they replace, and the clear height above the water greater, it being the experience of the department that washouts of bridges are almost always due to the fact that the bridge is too small to carry the water.

CITY MAPS.

Waltham, Mass., a city of about 32,000 population, is provided with a number of maps of its area, drawn to different scales for the several purposes. In his annual report for the year ending January 31, 1919, city engineer Henry F. Beal reported that a map of the entire city on a scale of 400 feet to one inch had been brought up to date and four black-line white prints of it had been made and mounted for wall maps; on one of which was to be plotted the house sewer mains, on another the water mains, and on a third, the storm sewer mains. A contract was made with a lithographer for five hundred copies of this map reduced to a scale of 800 feet to an inch, there being a constant demand for such maps.

Another map, drawn to a scale of 200 feet to an inch, and showing the water distribution system, hangs on the wall of the water department shop.

There are also large sectional maps of the city, on a scale of forty feet to an inch. There are tracings for the forty-four pages of what is know as the city atlas, from which prints are made and bound into book form. The locations and details of water mains and services, sewer mains and house connection, etc. are shown on 460 original plans, of which negatives and prints have been made so that the originals will not be worn or mutilated by service.

THE ENGINEER IN POLITICS*

By W. A. STINCHCOMB.†

Before entering into a discussion of the topic assigned to me today—"The Engineer in Politics"—I want to congratulate the officers of this organization, the program committee, and the secretary, for the splendid and unusual program arranged for this meeting, and particularly for bringing up for discussion the subject assigned to me, not that I feel qualified to properly and fully discuss the same, but because of its great importance.

To have prepared this program of topics of such social and human interest, I have no doubt, required a degree of daring of a kind not possessed by some in the profession. Too often, in my opinion, have engineering societies held themselves aloof, perchance feeling themselves above getting into discussions of political subjects.

Let me make myself clear in the use of the word "politics." I do not refer to it in its partisan sense, but I do most decidedly refer to it in a civic or governmental sense.

To say that the A. A. E. and its members shall not go into politics would be to deny to the country and the local communities within which it has chapters, the service of an organization of men, who, by natural ability, by education, by training, and by experience, are most capable of serving the public and in directing and educating the voters on questions of public policy, and would deny to its members the fulfilment of their obligations as citizens of this Republic.

Now I know that a natural tendency exists among engineers not to take an active part in politics, but by so doing, they evade their full responsibilities as citizens. In my opinion, a man's just as his abilities and opportunities increase.

Shall any one say that the engineer's training and experience does not better fit him to solve the problems of government as our civilization becomes more complex, than one trained in any of the other great professions?

What are some of these political problems?

In our cities, practically all of our public problems are subject to scientific analysis. Is the subject one of developing the physical plan of the city, including the adequacy and location of its highways, the kind and strength of its pavements, the development of its parks and recreation facilities, the working out of a proper drainage or the planning of its transportation facilities, either rail or water? Surely the engineer is best qualified to solve such problems. He is now called on for advice in these matters, and, in my opinion, he should be the one to largely decide.

In matters of public health as influenced by problems of sanitation, such as sewage and garbage disposal, water supply and building and housing regulations, he is best qualified.

On questions affecting the control of public utilities, such as transportation, electric or gas supply, and telephone service, his engineering training best fits him to bargain with the trained mind representing the public utility companies, and to know when the contract has been made, that justice is done both the public and service corporation.

As cities extend further into the realm of municipal ownership of these public utilities, his obligations to serve the public in an executive capacity in directing the management of such work increases and his fitness to serve grows.

Even in the welfare and social problems of the city, his analytical training fits him to search out the cause of our social evils and ills—to relieve them, rather than apply only palliative and preventative measures.

Shall any one say that he is less qualified to organize and direct the ordinary housekeeping affairs of a city, because of his training and experience?

One of the most difficult and always present problems of all government, is that of financing and taxation. It is the constant duty of the engineer in his practice to so design, execute and organize his work, so that in terms of unit cost, that cost shall be as low as possible. All problems of public taxation must go back to a proper appraisal of the property taxed, whether that property be in a tangible or intangible form. Here, again, his experience and training fit him well to efficiently serve.

Our national government problems are best solved when the engineering mind influences their solution.

And, so, in my opinion, the engineer should take a dominant part in politics, and this association, as an organization, should wield a forcible influence in determining the civic and governmental policies—not as a right only, but as an obligation, which both the engineer and the association owe to society.

POLITICAL ACTIVITY BENEFICIAL TO THE ASSOCIATION.

"But," I hear some timid soul say, "what effect will that action have on the engineer and this association?" In my opinion, it cannot be anything but beneficial.

This convention has had its attention called to the inadequacy of the salaries paid engineers in public service. Various means will be discussed as to methods by which salaries may be properly and equitably increased. How better can this be done, than that the members of this profession shall take an active interest in the political question of their communities?

We have noted the appointment of men neither fitted by education or training to take charge of departments of public service, which really require the services of the trained engineer. We have seen the engineer subordinated to such superiors. He has seemingly been content to let his "light shine under a bushel," and have the accomplishments of his brain and energy appropriated by those to whom they do not rightly belong. By a more active participation in politics, these injustices would be removed, and credit bestowed where it rightfully belongs.

We have seen national organizations or other professions jealously guarding the business interests of the members of their professions. There is the National Bar Association, the various national organizations of the medical fraternity, whose efforts are used not only in maintaining a proper code of ethics in the profession, but in seeing that the members of that profession as a body are not discriminated against by the passage or operation of what they consider to be unjust laws. And so in halls of legislatures, their representatives are seen when measures affecting those professions are under discussion—and the professions referred to do not have to do with the public work of the state in any degree, compared with that of the engineer.

It has always seemed to me that the engineer, himself, has been to blame for the position in which he is held by society and for the meagerness of the salaries paid by both public and private corporations for his services. He has been retiring in his nature, content to too large a degree to take his reward from the satisfaction growing out of difficult problems well solved and difficult work well performed.

I recognize the fact that there are certain kinds of professional advertising which are distasteful, but I know

*Paper before the American Association of Engineers.
†County engineer of Cuyahoga County, Ohio.

that you cannot expect to have the public place a proper estimate on the value of a profession, unless that profession itself, as an organized unit, holds it up to a high standard of value. This, in a large measure, can be accomplished by a proper indulgence by the engineers in the political problems and discussions of the day.

We cannot, in a democracy, expect to maintain our government for any length of time in advance of the intelligence of the voters. The intelligence of the voter is only expressed through the polls, and is influenced by the kind of political education which the voter received. In elevating the standard of citizenship, the engineer can, and should be a leader in his community. To be anything less not only results generally to the disadvantage of the individual, but decidedly to the disadvantage of his profession, and is a direct evasion of the responsibilities of citizenship, which his training and ability impose upon him.

Therefore, in my opinion, the members of this organization and the organization itself should take an active part in politics in the sense in which the word has been used.

They and it should become leaders in moulding public opinion in a manner free from partisan political bias.

PROPOSED SCHEDULE OF ENGINEERS' SALARIES.

For All Grades, from Chief or City Engineer to Inspector, on the Various Kinds of Public Work.

One of the aims of the American Association of Engineers is to improve the financial status of engineers of all kinds, and it has already succeeded in doing so for railroad engineers. In line with this idea, the Chicago chapter of the association has adopted a schedule of salaries, including not only those given below, but also those for architectural engineers, electric railway engineers, and large structural engineering organizations; these being omitted as not applying directly to public works engineers.

These are proposed as the salaries to be paid when the employment is continuous, and there is opportunity for advancement in rank and pay. Where there are interruptions in employment—idle seasons—it is suggested that the salary be such as to practically give these rates during service, and also half these rates during enforced idleness. For temporary positions the pay should be 50 per cent. greater.

Road Engineers.—This schedule is for a state having 60,000 to 100,000 miles of roads, and in which the highway department spends not less than $5,000,000 annually.

Chief highway engineer	$8,000—$10,000
Road engineer	5,000— 7,000
Maintenance engineer	4,500— 6,000
Bridge engineer	4,500— 6,000
Engineer of tests	3,000— 4,000
Division engineer (7,000 to 10,000 miles)	3,600— 5,000
Assistant engineer	2,700— 3,600
Resident engineer	2,700— 3,600
Chief designing engineer	3,000— 4,000
Designing engineer	2,700— 3,300
Junior engineer, class A	2,100— 2,700
Junior engineer, class B	1,500— 1,800
Inspector*	1,320— 1,800

* Technical training desirable but not essential, but must have had experience in highway construction if lacking such training.

Municipal Engineers.—The proposed schedules for municipal engineers are as follows:

City engineer: annual work, $5,000,000	$12,000—$15,000
City engineer: annual work, $2,500,000	8,000— 10,000
City engineer: annual work, $1,000,000	6,000— 7,500
City engineer: annual work, $500,000	4,000— 5,000
Department engineer	5,000— 7,500
Division engineer	4,000— 7,500
Assistant engineer	3,000— 3,600
Instrumentman (pref. tech, graduate)	2,000— 2,400
Rodman (high-school, 2nd grade)	1,080— 1,500
Inspector	1,380— 1,800
Architect	3,000— 5,000
Designing engineer (technical graduate, 10 years' experience)	4,000— 6,000
Designer (technical graduate, 5 years' experience)	3,300— 4,400
Detailer (technical graduate preferably)	2,000— 3,000
Tracer (technical high school)	1,200— 1,800
Draftsman, architectural	1,800— 3,000
Draftsman, map or topographic	1,800— 2,400
Draftsman, structural	1,800— 2,400

County Surveyor.—As a rule, this is not a salaried position, but it is of such importance that a sound policy would provide an office and pay for keeping open a stated number of days per week, depending upon the wealth and population of the county. The pay per day for land surveying should be adjusted to correspond with the value of the land, as follows, since the surveyor is responsible, and may be sued for damages due to erroneous work:

	Surveyor	Assistant
Land up to $25 per acre	$12.50	$3.75
Land at $25 to $200 per acre	18.00	5.00
Land over $200 per acre	20.00	5.00

A similar rate should be paid for work of the intermittent class or for drainage, leave or road work, with pay for a specific number of days per month to cover consultation and correspondence.

Deputy county surveyor	$3,000—$4,200
Employes on drafting and instrument work	2,100— 2,700

County Engineer.—Good roads organization in counties spending at least $500,000 annually on highway work:

County highway engineer	$4,200
Assistant engineer	3,000
Junior engineer, class A	2,400
Junior engineer, class B	1,800
Inspector (for qualifications see under "Road Engineers")	1,500

A similar organization is desirable for levee and drainage work, but must adapt itself to wider variation than the road work. Such adaptations can be made according to the particular work in hand.

State Public Utility Board.—For the engineering department of a board in a state having a population of 5,000,000:

Chief engineer	$12,000—$15,000
Assistant chief engineer	9,000— 10,000
Chief of railroad division	8,000— 9,000
Chief of gas division	6,000— 7,500
Chief of telephone division	6,000— 7,500
Chief of waterworks division	6,000— 7,500
Chief of service division	6,000— 7,500
Assistant engineer, grade 1	3,600— 4,800
Assistant engineer, grade 2	3,000— 3,300
Assistant engineer, grade 3	2,400— 2,700
Assistant engineer, grade 4	1,800— 2,100

State Public Improvement Project.—For such a project as the Illinois River improvement:

Chief engineer	$15,000
Assistant chief engineer	9,000
Principal assistant engineer	8,000
Bridge engineer	7,500
Office engineer	6,000
Field engineer	6,000
Office and field assistants	Same as in municipal schedule

Expert Service.—An engineer having a standing equal to the chief engineer of a railway or city engineer of a city spending $2,000,000 annually, $100 per day. An engineer who can qualify in court to give expert testimony, $25 per day. Intermediate figures for engineers of intermediate rank. All incidental expenses should be in addition to the rate named and should be paid for. Court testimony simply identifying a map or plan is not considered expert testimony.

The WEEK'S NEWS

Pennsylvania May Own Quarries—The Lincoln Highway—U. S. Investigation of Water Pollution—Jersey City Loses Water Purification Suit—Illinois Utility Commission Has Power Over Municipal Plants—Two Platoon System Installed in Texas Cities—New York State Income Tax in Effect—Scranton City Employes Strike—Buffalo's "Service-at-Cost" Plan Vetoed by Governor—Akron Votes Against Higher Fares.

ROADS AND PAVEMENTS

Proposes State Owned Quarries for Road Material.

Harrisburg, Pa.—Under the provisions of a bill introduced before the senate by Senator Eyre, Chester, state highway commissioner Sadler will be permitted to purchase land containing materials for use in the construction and maintenance of state highways. The measure was immediately reported from committee and read for the first time. The bill further provides that the highway commissioner will be permitted to quarry and prepare the stone for use in highway work and may manufacture any other materials used in the construction and maintenance of roads. He may also sell, furnish or supply such materials to contractors. It is also provided that the commissioner may erect all necessary buildings and purchase machinery and equipment neccessary in quarrying and preparing stone and manufacturing material. The provision of the act of May 30, 1911, under which the highway department is now conducted, that "that all work of construction, building or rebuilding highways, except for the repairing and maintenance done under the provisions of this act, shall be by contract," is amended to read "may be by contract." The highway commissioner is authorized by the amendment to construct, build or rebuild any highway or highways, for the construction, building or rebuilding of which he was authorized to contract under the provisions of the present act. In commenting on the proposed law, highway commissioner Sadler said. "Conditions have arisen which would indicate the advisability of the passage of this bill. The state highway department believes that with the power conferred upon it by these amendments it will be in a position to construct a state highway system in Pennsylvania in the most economical manner possible."

Types of Construction on Lincoln Highway.

Detroit, Mich.—A. F. Bement, vice-president and secretary of the Lincoln Highway Association, has issued the following figures as to the present types of improvement along the route. The total transcontinental mileage is 3,323.5.

New Jersey—Total mileage	66
Mileage in corporate limits	27.2
Concrete, brick and city paving	36
Bitulithic macadam	30.8
Pennsylvania—Total mileage	378.8
Mileage in corporate limits	105.7
Concrete, brick and city paving	70.8
Bitulithic macadam	293.1
Dirt	14.9
Ohio—Total mileage	268.3
Mileage in corporate limits	36.1
Concrete, brick and city paving	85.7
Macadam	133.9
Dirt	48.7
Indiana—Total mileage	185.1
Mileage in corporate limits	22.9
Concrete, brick and city paving	67.1
Gravel and macadam	118
Illinois—Total mileage	179.6
Mileage in corporate limits	21
Brick, concrete and city paving	46.2
Gravel and macadam	96
Dirt	37.4
Iowa—Total mileage	400.8
Mileage in corporate limits	43.8
Concrete, brick and city paving	29.9
Gravel and macadam	95.1
Dirt	275.8
Nebraska—Total mileage	461.6
Mileage in corporate limits	25.4
Concrete, brick and city paving	14.3
Gravel and macadam	133.2
Dirt	304.8
Sand	9.3
Wyoming—Total mileage	445.5
Mileage in corporate limits	3.2
Concrete	.2
Graded gravel	111.9
Natural gravel	54.1
Graded dirt	173.1
Natural dirt	91.2
Shale	15
Utah—Total mileage	231.8
Mileage in corporate limits	7.1
Concrete	5.6
Macadam and warrenite	55.8
Graded gravel	63.7
Natural gravel	49
Dirt	53.7
Light sand	4

With the completion of the Fisher Pass and Goodyear sections in western Utah about July 1, about fifty miles will be cut from the total trans-Utah distance, and an excellent highway provided entirely across the state. The cut-off across the Great American Desert, a bee-line for a distance of about eighteen miles, will be one of the most interesting and historic sections of the route in the country, traversing a formation the like of which is to be found nowhere else in the world.

Nevada—Total mileage	475.8
Mileage in corporate limits	8.3
Pavement	2.3
Macadam	15.3
Graded gravel	189.9
Graded dirt	19.6
Natural gravel	123.6
Natural dirt (poor)	125.1
California—Total mileage	340
Mileage in corporate limits	9.2
Concrete	93.2
Macadam	87.2
Asphalt	3
Graded gravel	25.2
Graded dirt	23.1
Natural gravel	8.3

The Lincoln Highway Association advises that the route will be open through to the Pacific Coast by June 1, and was open as far as the Sierra Nevadas at the Nevada-California state line May 1.

SEWERAGE AND SANITATION

Public Health Service Suggests Ordinances.

Washington, D. C.—According to a statement by the U. S. Public Health Service, a large part of the administrative efforts to control venereal disease consists in educating the people concerning the nature of these diseases and their influence on the health and welfare of mankind, restrictive public measures also play an important role. The campaign waged in this country against the venereal diseases has already been carried on sufficiently long to indicate the desirability of a number of legislative enactments having to do with the reporting of cases of venereal disease, the detention of certain types of venereally infected, the control of prostitution, the traffic in patent nostrums for the cure of venereal diseases, and the like. Based on this experience and on general epidemiological

principles, the Public Health Service, through its Division of Venereal Diseases, has just prepared a compilation of suggested ordinances which have proved successful in combating venereal diseases. These measures are recommended for municipal enactment, with the suggestion that in every case they be examined by competent local counsel for changes in form, or in substance if necessary, as may be dictated by special constitutional, legislative, or charter considerations. It is manifestly impossible, says the Service, to prepare forms of ordinances which will, in the original wordings, exactly fit the varying local requirements. The purpose of the several ordinances contained in this pamphlet is only to suggest in substance, desirable and effective legislation. Changes in titles, enacting clauses, penalty provisions, and other formal or administrative details may be found necessary. It is presumed that every city has general legislation prohibiting prostitution, pandering, and the keeping of disorderly houses, and the suggested measures are supplemental to such gneral legislation. Each of these suggested ordinances has been in successful operation in some city, and has been found effective in its particular phase of the general fight to prevent the spread of venereal diseases. Therefor, it is further suggested that alterations of text be confined, as much as possible, to purely formal considerations. Persons interested in such legislation or ordinances may obtain copies of this bulletin, entitled "Venereal Disease Ordinances. V. D. Bulletin No. 39," by addressing the United States Public Health Service, Washington, D. C.

To Finish Water Pollution Investigation.

Washington, D. C.—The United States Public Health Service is preparing to resume its investigation of the pollution of the Ohio river, which was interrupted when the United States entered the war. The investigation had proceeded about four years when it was terminated temporarily pending a restoration of peace. Dr. W. H. Frost, who is in charge of the investigation, will reopen his former headquarters at Cincinnati on or shortly after July 1, and the work will be taken up where it was left off. Dr. Frost, at Washington, said that much will depend as to the scope of the coming operations on congress, which has yet to make the necessary appropriation to continue the investigation. It is expected, however, that the enactment of this appropriation will be one of the early acts of the new session. Formerly from fifteen to twenty experts were engaged in the undertaking and Dr. Frost expects to have that many at work again soon after July 1. "The investigation, I should say, is about 90 per cent completed," said Dr. Frost. "I would not care to make any statement now as to the conclusions reached, because in an undertaking of this kind, conclusions may hinge largely on the remaining 10 per cent of research. I will say, however, that the investigation is an important one because it is a general study of the pollution of navigable waters and is not entirely local to the Ohio river and its tributaries."

WATER SUPPLY

City Loses Water Purification Lawsuit.

Jersey City, N. J.—The East Jersey Water Supply Company has at last won definitely and finally the fight to evade the payment for the proposed million-dollar intercepting sewer that Jersey City feels is needed in the Rockaway River valley to safeguard Jersey City's water supply against pollution. The sewer, if it is built, will have to be paid for by the people of Jersey City. The action of vice-chancellor Stevens in dismissing the application of Jersey City to reopen the decree made in 1910, by which the Jersey City Water Supply Company was permitted to substitute a chlorination plant in the Rockaway watershed for the intercepting sewer plan has just been affirmed by the Court of Errors and Appeals. Albert C. Wall, who handled the case for the city, argued along the line that the chlorination process was defective as a means for purifying potable waters. He contended that scientific tests and discoveries had clearly demonstrated in recent years that the use of hypochlorite does not afford the remedy claimed for it some years ago. When Jersey City acquired the Boonton water works in the Rockaway River valley from the Jersey City Water Supply Company, which in reality was the East Jersey Water Co., it was stipulated that the water company in return for the $7,000,000 paid that company for that plant, must provide adequate safeguards against pollution. Subsequently the company got the Court of Chancery to say that the treatment of the water at Boonton with hypochlorite would be just as good as setting up a system of expensive intercepting sewers. So the water company proceeded to kill the bacteria in the reservoir by chemicals. More recently Jersey City became convinced that the chlorination plant at Boonton would no longer be adequate, and that pollution of the river had reached such a stage that the hypochlorite would not answer in the years to come as a complete remedy for the pollution. It was then decided than an intercepting sewer must be built. When it came to deciding who was to foot the bill, the water company interests fell back on that decision rendered years ago by the Court of Chancery tc the effect that the chemical treatment of the water is just as effective as an intercepting sewer would be. Corporation Counsel Milton told the city authorities that the East Jersey could not be forced to pay for that sewer. This view was disputed and the city commission engaged former congressman Marshall Van Winkle to give a special opinion on the matter. Mr. Van Winkle finally decided tnat Mr. Milton was right, and that the city would have to pay for the sewer. Still there were differences of opinion. In order to leave no opportunity for the charge that the city government was favoring the East Jersey, the city commission decided to engage Albert C. Wall to fight in the Court of Chancery for the reversal of the old Chancery Court decision that relieved the East Jersey of the duty of putting in an intercepting sewer. This is the case that the Court of Errors and Appeals has just decided against Jersey City, and in favor of the East Jersey, thus upholding the view that Mr. Milton has held all along. Thus far about $40,000 have been spent in counsel fees and expert fees in connection with this fight. The plans for the building of the intercepting sewer are being held in abeyance in the City Hall in order to await the outcome of the new litigation started by the East Jersey to prevent the building of the sewer, the company now claiming that the emptying of the effluent from that sewer into the Rockaway River below Boonton would damage the Passaic River water supply, upon which the East Jersey depends. The Rockaway River empties into the Passaic River above the Little Falls pumping station of the East Jersey.

To Appeal Decision Against Commission's Power.

Seymour, Ind.—It has been announced from Indianapolis that the Indiana public service commission has instructed Ele Stansbury, attorney-general, to prepare an appeal from the decision of John H. Edwards, of Mitchell, special judge in the Jackson circuit court at Brownstown, who ruled that the commission does not have authority to change existing water rates here until after January 1, 1920, when the first thirty-year period of the franchise will expire. (This decision was recorded in these pages last week.) The city will continue in the status of an interested third party in the proceedings, and the council has instructed John M. Lewis, city attorney, to take such action in connection with the appeal as he believes necessary to protect the interests of the company's patrons. The order of the commission providing for a general reduction of 10 per cent. in all water rates was issued about a year ago, but a temporary injunction was obtained restraining the commission from enforcing the order. The city is interested in the appeal, as it is believed that in case of a reversal the reduction order will become effective from the date specified by the commission. The water company has not surrendered its franchise to operate under an indeterminate permit, as many utilities have done. It insists that the contract made with the city thirty years ago remains in force until a new contract is made. Some are urging the city

tc buy the water plant, but those who are well acquainted with conditions say that it would be practically impossible for the city to take it over. The city could buy it only by issuing bonds for the entire amount, and municipal ownership of public utilities is not strongly favored here. If the city decides to buy the property, notice must be given to the company before July 1, under the terms of the franchise. Unless such notice is given, the franchise is automatically extended for another period of thirty years.

STREET LIGHTING AND POWER

City Loses Power Franchise Case.

Omaha, Neb.—The last hope of the city to "knock out" the franchise of the Nebraska Power company, formerly the Omaha Electric Light & Power was given up when the United States supreme court refused to interfere with decisions already made by the federal court for the district of Nebraska and the United States court of appeals. The fight on this particular phase of the litigation between the company and city started in 1914 following a decision by the United States supreme court that the company has a perpetual franchise. "The city then took the position that the company had a franchise to supply electric light, heat and power only to the consumers which it then had on its books," said W. D. McHugh, attorney for the company. "The city council proceeded to pass a resolution instructing the city engineer to stop the company from laying any more wires or making any further connections for electric service of any kind. Enforcement of the resolution would have kept dozens of new buildings from having electric light. The company immediately went into federal court and secured a restraining order and later an injunction. Federal judge Woodrough held that the city council had no power whatever to enforce the resolution. The city appealed to the circuit court of appeals, and a decision was rendered from that bench, affirming Judge Woodrough's decision. The city had no right to make further appeal of the case, but it did ask the supreme court to review the case, and this the supreme court has done, affirming the decisions of both the lower courts. This ends litigation on the question of the company's perpetual franchise." While the present decisions affirms the possession of a franchise by the Nebraska Power company to supply electric light, power and heat in the city of Omaha does not give it an exclusive franchise, it is pointed out by city officials. The city is at liberty to buy the plant or to build a competing plant at any time.

Council Grants Higher Rate Franchise.

Canton, O.—The city council has passed an ordinance granting the East Ohio Gas company a new franchise for a ten-year period, and fixing a new scale of prices which will increase the cost to the consumer from 10 to 25 cents per thousand cubic feet, depending upon the amount consumed. The new contract is drawn up practically on the terms of the company, but the city secured two important concessions, one that the city shall have only natural gas, and the other that the company shall make extensions in the city and the territory to be annexed. The new scale of prices which will soon go into effect follows: For the first 5,000 cubic feet, 48 cents per 1,000 cubic feet; for the second 5,000 cubic feet, 53 cents per 1,000 cubic feet; for the third 5,000 feet, 59 cents per 1,000 cubic feet; for all gas used over 15,000 cubic feet, 63 cents per 1,000 cubic feet. The consumers are allowed a discount of three cents per 1,000 cubic feet, if their bills are paid within 10 days. The rate now paid by citizens is 37 cents per 1,000 cubic feet, with a discount of two cents. The new franchise provides that if less than 2,000 cubic feet is used, the company can make a charge for 2,000 feet. The franchise may be terminated at any time within the ten years by either party, at the end of six months, after written notice has been served. The contract states that the company, having contracts to furnish gas with other cities, and the supply being uncertain, shall be required only to use its best efforts to procure a supply of gas for Canton, and to apportion to it such proportion of natural gas as it is from time to time able to procure, as the number of consumers bears to the total number of consumers of the company. Another provision covers the making of extensions in the city and in new territory where there is at least one consumer to every 100 feet. It is provided that the company need not put on more consumers if it is unable to supply sufficient gas to furnish consumers in any section.

State Commission Declared Supreme Over City Plants.

Springfield, Ill.—Municipalities owning water or electric plants cannot so much as extend water mains without the consent of the state utilities commission under a decision of the state supreme court, according to the construction put upon that decision by fifteen or more city attorneys gathered here to consider what action should be taken in behalf of the municipalities. Springfield owns and operates an electric light plant and serves individuals in private dwellings. The Springfield Gas and Electric Co. filed a petition with the utilities commission, asking that the municipality be compelled to file a schedule of its rates under which individuals were served. The municipality resisted, claiming exemption under section 10 of the utility act. The circuit court sustained the objections, but the state supreme court, upon appeal, declared that such exemption rendered section 10 unconstitutional and remanded the case. Legal representatives of Illinois cities owning and operating light and water works plants met here to consider the situation thus created, and agreed that if the supreme court grants the re-hearing asked for, all cities interested will ask leave to plead. Corporation counsel Monroe, of Decatur, said that the logical conclusion would be that under the decision of the supreme court of the city of Decatur, for instance, could not so much as extend water mains, without first asking permission of the state utilities commission. That it would not be legally possible under that construction of the statute for the city to issue bonds to make extensions or betterments of the plant, except that the utilities commission gave approval, even though the electors by a majority vote, approved the bond issue.

FIRE AND POLICE

Park Building for Safety Museum.

New York, N. Y.—Park commissioner Francis D. Gallatin has signed the lease, giving the Safety Institute of America the right to occupy the Arsenal in Central Park for the purpose of a permanent exhibition of safety appliances. It is the intention of the institute to restore the building to its original condition, both as to its interior fittings and its sanitary state. It is believed that $125,000 will be necessary to do this. In making the improvements the institute will provide for the police sub-station in the basement of the building. James Speyer, one of the officers and trustees of the institute, recently presented it with $50,000, part of which at least will be used in the work of restoring the building. R. M. Little, a director of the institute, said: "The grant of the city of the Arsenal means a distinct advance in the important work of the Safety Institute. When housed in the Arsenal Building the institute will co-operate with the Department of Public Safety and the schools, in striving to make the streets and thoroughfares of the city safe, and to prevent accidents, save life, and also to carry the message of safety to the homes of the people. In doing this work the institute located in the Arsenal can visualize the best type of playgrounds and recreational centres through models, which will be observed by thousands of visitors to the park, and therefore the work of the institute will synchronize with the purpose of the park, and not be an intrusion upon its legitimate use. There is a timeliness in securing the Arsenal for the enlargement of this important work, because of the new emphasis upon improved industrial conditions and the relation between employers and employes.

In Europe there are more than twenty safety institutes and museums of safety, but only one in our country of any size, and this one is located here in New York. In this great metropolitan district there ought to be a large institution of this type that would exert a commanding influence throughout our country and stand the safest and most helpful conditions for work, for play, and for recreation."

Two-Platoon System Developments.

Dallas, Tex.—The double platoon system has been installed in the fire department, and Chief Thomas A. Myers is satisfied with the way it has worked out. The men who are on the day shifts work from 8 o'clock in the morning until 6 o'clock in the evening, dividing the day ten and fourteen hours, since the men on duty at night are able to get considerable sleep.

New Rochelle, N. Y.—The fire commission has voted to install the two-platoon system in the department on July 1st. This step will greatly benefit the paid men of the department, upon whose petition the action was taken.

Waco, Tex.—The double platoon system for the Waco fire department will become effective on October 1 of this year, as a result of a decision by the city commission. At present the firemen are subject to duty twenty-four hours continuously, being only allowed to absent themselves at meal times.

GOVERNMENT AND FINANCE

City Manager Appointed.

Lapeer, Mich.—Ray S. Blinn, city engineer of Mt. Vernon, O., has been appointed city manager by the city commissioners, at a salary of $2,700. Mr. Blinn served as city manager of Westerville, O., for one year. He is 46 years old, and a civil engineer, having been graduated from Ohio State University.

State Income Tax for New York.

Albany, N. Y.—About 500,000 persons in the state, having incomes of $1,000 a year or more, will pay the state, on or before March 15 next, approximately $40,000,000, under the new income tax law signed by Governor Smith. Other measures in the legislative tax program designed to refill the much depleted state treasury, including the increased tax on the net incomes of all manufacturing and mercantile corporations and the non-resident decedents estate tax, were also approved by the governor. The income tax provides a graduated scale of 1 per cent on incomes up to $10,000, 2 per cent up to $50,000, and 3 per cent above $50,000, payable at the same time as the federal income tax. It is to be imposed on single persons receiving more than $1,000 a year, and on married persons earning more than $2,000. Provision is made for $200 exemption for each dependent of a married person. State officials, freed from impost under the federal act, must contribute under the state law, and the only persons exempted from payment are federal employes. Nonresidents will be taxed on their entire income unless the laws of their home state reciprocate, no exemptions being permitted them. The new statute is to be administered by the state controller. In many essential respects it resembles the federal income tax law. In so far as they affect the majority of taxpayers, gross and net incomes will mean the same under both laws, as the deductions and exemptions are in substantial accord. Corporations are not included, and although partnerships must file a return, they are taxed only as individuals, as under the federal laws. A return on incomes from estates and trusts must be made by the fiduciary. Unlike the federal statute, the entire net income of nonresidents earned in this state is taxable—2 per cent of salaries of $1,000 or over being withheld by their employers —"withholding agents." The receipts will be divided equally between the state and localities based on the assessed valuation of realty, and not according to amounts collected. Utmost secrecy of the returns is assured under heavy penalty, similar to failure to make return or pay the tax. Arrangements are being made to organize the work, and already a series of practical questions and answers interpreting the law are being prepared for distribution shortly. More than $8,000,000 revenue will be added to the State Treasury from the corporation net income tax amendment, corporation statute, enacted in 1917, to include all business corporations, other than public service, insurance, and moneyed corporations. It also increases the rate from 3 to 4½ per cent. Last year manufacturing and mercantile companies contributed more than $16,000,000, and before June 30, next, more than $18,000,000 will be collected.

City Employes Out on Strike.

Scranton, Pa.—More than three hundred employes of the department of public works went out on strike because of the city's refusal to abide by the award made by the board of arbitration some weeks ago. The decision of the men to quit work was reached at a special meeting which was attended by many local labor leaders, including S. J. McDonald, president of the Central Labor union. The men who walked out are those in the bureau of ashes and garbage and the bureau of highway and sewers, which takes in the men engaged in making repairs to the city's paved streets. The only employes of the department of public works who remained on the job are several clerks and two barnmen at the city stables, according to director of public works Robert W. Allen. The men voted to remain on strike until mayor Connell and councilmen Campbell, Wirth and Saville consent to accept the arbitration award in its entirety. The state department of labor and industry sent two mediators, but the mayor is said to have told them that the city solicitor had declared the award to be illegal, and that the city could not accept it. The latest trouble between the city and its public works employes developed a few weeks ago, when the four arbitrators named to act in the controversy made an award providing that the employes be given the money the city saved during the six weeks they were on strike in January and February. This was in the first portion of the award. The second part of the award stated that the employes were to receive an advance of 10 per cent in wages over the award of July, 1918. The employes accepted the award in its entirety. The city, however, rejected the first part and accepted the second. This started the wrangle again. At the meeting, Mr. McDonald declared that the employes had done everything possible to avoid the strike. "Now it is a fight for the preservation of the principles of arbitration for settling disputes."

TRAFFIC AND TRANSPORTATION

Governor Disapproves "Service-at-Cost" Plan.

Buffalo, N. Y.—Governor Smith has vetoed the bill to permit the city and the International Railway to agree on a "service-at-cost" plan. He decided that the bill diminated with the control which the state had spent years in establishing. In his message, Governor Smith said:

> The contract, if this proposed statute be calid, once made, can only be altered by the joint consent of the parties, viz., the city and railway, and the bill provides that all acts or portions of acts not consistent therewith, including the provisions of the railroad law and the public service commissions law, shall have no application to said city, or to any company or companies, parties to the contract hereby authorized.
>
> "This measure thus in effect abrogates all authority or control now exercised under the laws of the State over the International Railway, not only in the city of Buffalo, but for that large area of surrounding country in which it operates. Regulatory powers are taken from the Public Service Commission and are allowed to be a matter of contract between the railway and the city, which contract can only be altered or amended by the consent of the railway."

The bill had been passed by the legislature at Albany, and the taking of evidence by three arbitrators chosen to determine the amount upon which an agreement might be based has been completed. There is still one means of obtaining higher fares left for the International Railway through a revision of fares by the Public Service Com-

mission for the Second District. The opportunity arises through a case before the commission which involves a matter of law that has now been taken by the city to the highest state court, the Court of Appeals. The company had promised that it would make no effort to secure a rate decision from the commission pending the outcome of the arbitration proceedings, but Governor Smith's veto apparently has reopened the company's side of the matter. The case in question started in the courts through the refusal of the commission to receive the answer of the International Railway to a rate complaint filed with the commission several years ago by the municipal authorities. At that time the city wanted the 5-cent fare reviewed with the aim of getting a 3 or 4-cent fare in Buffalo. The company, however, secured an injunction prohibiting the commission from hearing the case, because of the provisions of the so-called Milburn agreement between the city and the company. For almost four years the case was suspended, until the company sought to renew the negotiations by seeking to file an answer, and inviting the commission to make an investigation to determine an equitable rate of fare. The city sought to withdraw its complaint, and the commission refused to receive the company's answer. Recently, however, Justice Rudd, of the state supreme court, granted a writ of mandamus directing the commission to receive the company's answer. The city immediately took an appeal to the Appellate Division of the Supreme Court, which recently handed down a decision sustaining the company. As the proceedings by stipulation were amended so as to treat the case as one of certiorari rather than mandamus, the Appellate Division annulled the determination of the Public Service Commission, and remitted the proceedings to it for consideration. It gave leave for an appeal to the Court of Appeals, and certified the following question—Has the commission jurisdiction and power, under the facts shown, to regulate the rate of fare to be charged? The city has made the appeal, and the case will be argued at the present term. These procedings deal with the urban rates of the International Railway. They are distinct from contemporaneous proceedings regarding interurban rates, over which the commission has just been held by the supreme court to have the power of regulation.

Legislation Permits Street Railway Legislation.

Taunton, Mass.—Residents of the communities adjacent to the route of the Taunton, Norton & Attleboro Street Railway may provide for the maintenance and continuance of the road, according to a bill which has been passed by the legislature. The bill gives the cities of Taunton and Attleboro, and the towns of Mansfield and Norton, the right to purchase and hold shares in the road to such an amount as the Public Service Commission may determine, or may purchase or take by right of eminent domain, the tracks, poles, trolley, feed and stay wires or other property of the company. This they may do either jointly, or each may act independently. It is necessary, in the case of the towns of Norton and Mansfield, that two-thirds of the residents of each town gathered in special town meeting called for the purpose within five years, shall vote in favor of the action. A two-thirds vote of the council of Taunton or Attleboro is necessary for the action to be legal in those cities. Each of the communities is authorized under the act to borrow money outside the legal debt limit. The bill has been examined by leading residents of the cities and towns interested, and has met with general approval.

Higher Fares Defeated in Referendum.

Akron, O.—The Morse-Witwer ordinance, providing for a 6-cent fare on the lines of the Northern Ohio Traction & Light Company, was repealed by a referendum vote of 10,563 to 2,394. Only four precincts out of 114 were in favor of the ordinance. The ordinance, which was to be revocable after one year, was intended as a temporary measure only, to give an opportunity for further study, with full examination of the affairs of the Northern Ohio Traction & Light Company, looking toward the framing of a new franchise ordinance. The opposing arguments, which won out, seemed to be that the light and power departments of the company were highly profitable, that the company had $2,000,000 surplus available for electric railway improvements; that it had increased dividends last year on the common stock from 5 per cent to 7 per cent, and that the present franchise provided sufficient power to compel extensions and the giving of adequate service. The Car Riders' League, led by Mayor Laub, polled votes in the big rubber plants which overwhelmed the Citizens' Progressive Association, which was organized by leading manufacturers, bankers, and business men to boost the ordinance as a necessary part of the plans for civic improvement. Before the election, the Citizens' Progressive Association, which, as explained previously, represented men in every industry and walk of life, conducted an extensive publicity campaign in favor of the ordinance. In this campaign the railway company took no part. It was the first referendum in Arizona.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Statutes in Force Part of Contract.

(Ohio) Statutes in force when a contract is made by municipality enter into and become a part of contract and its obligation is to be measured and performance is to be regulated by the terms and rules which they prescribed.—City of Cincinnati v. Public Utilities Commission, 121 N. E. 688.

Abandonment of Railway Franchise—Operation at Loss—Constitutionality.

(Ky.) Where a street railroad must be necessarily operated at a loss or abandoned, and the franchise is permissive only, to require continued operation is to violate Const. § 13, providing that private property shall not be taken for public use without just compensation being previously made.—Potter Matlock Trust Co. v. Warren County, 207 S. W. 709.

Venereal Disease Examination—Legality of Requirement.

(Iowa) Code, §§ 2565, 2568, and Code Supp. 1913, § 2571a et seq., together with the rules of a local board of health, do not authorize the board of health to deprive of his liberty, one suspected of venereal disease, for the purpose of forcing the exposure of his body to examination and compelling the extraction of blood from his veins in search of evidence of the disease.—Wragg v. Griffin, 170 N. W. 400.

Order of Utilities Commission—Power to Reopen.

(Ohio) Where an order of Utilities Commission has been entered in a cause pending before it by agreement, and in pursuance of contract of settlement between parties to pending controversy, commission has no power to open up and set aside such order and relieve either of parties from terms of contract during time covered thereby.—State v. Marshall, 121 N. E. 700.

Taxing Power and Contracts Modified by Legislature.

(Va.) The power of a city to tax is a "governmental power," which can only be exercised under authority conferred by the General Assembly, and the statutes under which it is exercised by a city are subject to modification or repeal at the pleasure of the Legislature.—City of Lynchburg v. Lynchburg Traction & Light Co., 97 S. E. 780.

Contracts made by a city with its citizens as to taxation are subject to modification by the Legislature, and taxation by a municipality can in no event be made to depend upon contract.—Id.

A city cannot enter into a contract in derogation of its governmental power to levy a tax.—Id.

NEWS OF THE SOCIETIES

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

June 17-19.—TRI-STATE WATER AND LIGHT ASSOCIATION OF CAROLINAS AND GEORGIA. Ninth annual convention, Greenworth, S. C. Secretary treasurer, W. F. Stieglitz, Columbia, S. C.

June 17-20.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, St. Paul-Minneapolis. Secretary, Charles W. Hunt, 33 W. 39th St., New York, N. Y.

June 23-26. — SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, Coates House, Kansas City, Mo. Secretary, E. L. Fulkerson, 617 Washington St., Waco, Tex.

June 24-27. — AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University of Pennsylvania.

June 24-27.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

Aug. 26-28.—LEAGUE OF CITIES OF THE THIRD CLASS IN PENNSYLVANIA. Twentieth annual convention, Allentown, Pa. Secretary, Fred H. Gates, city clerk, Wilkes-Barre, Pa.

Oct. 27-30.—AMERICAN PUBLIC HEALTH ASSOCIATION. Annual meeting, New Orleans, La. Secretary, A. W. Hedrich, 169 Massachusetts ave., Boston, Mass.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Springfield, Ill.

New York State Conference of Mayors and Other City Officials.

The tenth anniversary convention of the New York State Conference of Mayors and Other City Officials will be held at Schenectady, N. Y., on June 10, 11, and 12, at which time, the New York State City Clerks' Association will hold its twelfth annual meeting.

Monday evening will be devoted to meetings of the advisory committee, and of the bureau council of the conference.

The first session will be opened Tuesday morning at 10.30, Palmer Canfield, mayor of Kingston, presiding. Charles H. Simon, mayor of Schenectady, will welcome the members, and president Walter R. Stone, mayor of Syracuse, will deliver the annual presidential address on "Progress of New York State Cities, and Problems They Are Facing." The following officers will then report: Mayor James R. Watt, Albany, treasurer; mayor Samuel A. Carlson, Jamestown, chairman, Advisory Committee, and mayor H. Clayton Midlam, Rome, chairman, Bureau Council.

The following committee chairmen will submit their reports:

Mayor Cornelius F. Burns, Troy, General Legislative Committee; Julius Frank, Ogdensburg, Assessment and Taxation Committee; mayor William J. Wallin, Yonkers, Special Committee on Municipal Revenues and Taxation; mayor Mark I. Koon, Auburn, Special Committee on Economic Rehabilitation after the War; Mayor Rosslyn M. Cox, Middletown, Special Committee on Coal Supply; corporation counsel Arthur L. Andrews, Albany, Special Committee on Revision of Second Class Cities Charter; commissioner of public safety Walter W. Nicholson, Syracuse, Special Committee on Standardization of Salaries of Policemen, School Teachers and Firemen; Charles C. Duryee, Schenectady, Joint Committee on Model Health Department Budget and Accounting System; commissioner Nicholas J. Hayes, New York City, Committee on Water Supply.

The second session on Tuesday afternoon, will be presided over by Victor C. Lewis, mayor of Fulton. "Principal Health Problems" will be discussed. The subject will be covered by Charles C. Duryee, M. D., who made the best score of city health departments for the state department of health. A business session will follow.

The evening's session will be a joint session of the Conference and the City Clerks' Association, Ralph S. Butts, mayor of Poughkeepsie, presiding. "Municipal Tax and Financial Problems" will be taken up. State Senator Frederick M. Davenport, chairman of the joint legislative committee to investigate municipal finances and taxes, leading with a paper. Another business session will follow.

The fourth session will be held Wednesday morning, Le Roy E. Barnes, mayor of Binghamton, presiding. The subject will be "Solving the Traction Problem," and the solutions presented will be: "By Increasing the Revenues of the Street Railway Companies," Dr. Thomas Conway, Jr., Professor of Finance, University of Pennsylvania; "By a Service-at-Cost Plan," Harlow C. Clark, Editor of "Aera"; "By Private Operation and Municipal Ownership," Thomas E. Mitten, chairman executive committee of the Philadelphia Rapid Transit Company, and "The Problem from the Public Point of View," Delos F. Wilcox.

A "Symposium of Municipal Needs" will occupy the fifth session, in the afternoon, the presiding mayor being R. Grant Thorpe, Port Jervis. Each mayor, or some official designated to represent him, will have five minutes in which to describe his city's most important and immediate problem, after which there will be a general discussion.

The sixth session will be another joint one, and mayor Abram Zoller of Little Falls will preside. Senator Clayton R. Lusk, chairman of the joint special legislative committee to investigate seditious activities, has been invited to speak on "How the Cities Can Assist the State in Stamping Out Bolshevism." Governor Alfred E. Smith has been invited to speak on "The State and the Municipalities."

The final session, Thursday morning, will also be joint. Mayor Clarence Smith of Johnstown will preside. "The Delinquent Tax Problem" will be the subject of discussion, led by William J. Wallin, mayor of Yonkers.

During the Conference, the members will be entertained by three cities. Schenectady will entertain with an auto tour, band concerts and social session on the first day and at a banquet on the second day. At noon on the second day the city officials will be taken to Amsterdam where they will be entertained by that city at a luncheon before the afternoon session and an auto tour after the session. After the final session on the third day the city officials will be taken to Saratoga where they will be the guests during the afternoon of the State Conservation Commission, the city of Saratoga and the Chamber of Commerce.

International Association of Police Chiefs.

The twenty-sixth annual convention of the International Association of Police Chiefs was held at the Grunewald Hotel, New Orleans, April 14 to 16.

A number of important subjects were discussed, including the threatened Bolshevik problem; the problem of dealing with the enforcement of national prohibition, and new methods being employed by crooks throughout the country in the commission of crimes. Methods of closer cooperation between police departments were also considered.

Following discussion on the salaries of patrolmen, a committee of three was appointed to draft a resolution calling upon the officials of every municipality in the United States and Canada to "make bids for the best possible men" by offering good salaries and adopting work schedules that will bring about contentment among the members of the police departments. In this way the standard of police efficiency in every city will be greatly improved. The members appointed on the committee on resolution were: Raymond W. Pullman, Washington, D. C., George M. Beach, Waterbury, Conn., and Richard T. Battersby, Jersey City, N. J.

The discussions on the subject of increased salaries and reduced working hours brought out the fact that in most of the larger cities of the country, and in many of the smaller cities, the men work only eight hours a day in three shifts.

When Michael T. Long, president, suggested that a resolution be adopted looking towards getting a uniform wage scale for police all over the country, August Vollmer, chief of police of Berkeley, Cal., said he thought

(*Continued on page 395*)

INDUSTRIAL NEWS

Construction Activity.— Bridge and structural shops booked 40 per cent more business in April than in March, according to the records of the Bridge Builders' and Structural Society, 50 Church Street, New York, collected by its secretary, George E. Gifford, which show that 24½ per cent of their capacity, or 44,100 gross tons, was contracted for in the past month, as compared with 17½ per cent in March, 12½ per cent in February, 12 per cent in January, and 64 per cent in April, 1918. The average business taken on in the four months of this year is less than 17 per cent of capacity, as against 55 per cent in the same period of 1918.

The Western Willite Road Construction Co., announces the appointment of D. L. Reaborn, for the past four years superintendent of the Mt. Rainier National Park, Washington, and formerly division engineer, Los Angeles aqueduct, as chief engineer. His headquarters will be in Los Angeles.

New Plant for H. W. Clark Company.

The **H. W. Clark Company,** Mattoon, Ill., manufacturers of the "Clark Meter Box," and allied lines of water works materials, now occupies its new factory just completed at Mattoon.

The Clark Co.'s big plant of over 45,000 sq. ft. of floor space was completely destroyed in the tornado of May 26, 1917. Since the tornado and prior to removing into the new plant this company has been operating in temporary quarters with a foundry located in Shelbyville, and the other allied departments in Mattoon. In this way it succeeded in taking care of its many customers and holding its business together in a satisfactory manner.

The new plant is one of the most modern in that section of the country, being built of steel sash window and steel sash ventilation and hot room valley roof construction. It is equipped with overhead traveling cranes and trolley system, and with modern efficient and rapid operating machinery throughout. The plant comprises an engineering and drafting department, pattern shops, gray iron foundry, brass foundry, blacksmith shops, machine shop, sheet iron works, and nickel plating plant. It is located on two spurs from the Illinois Central Railroad, being supplied with two tracks, one for incoming material, and the other for outgoing finished products.

The H. W. Clark Co. has been in business for more than 25 years, and its line is widely known.

The "Clark Meter Box," one of the first products, in use thirty years, is now made in over one hundred different models and sizes, in addition to the popular first sizes submitted to the trade, thus fitting installation conditions in every climate. It cares for the largest size meters as well as the smallest, with the same uniform manner of housing, thus facilitating the reading and care of the meter in service.

The line as marketed by the Clark Company now comprises also "Teksagon" meter couplings, riser meter couplings, and Clark meter coupling yokes, service boxes (two models), valve boxes (three models), valve housings, valve housing covers and lids, iron collapsible forms (for molding box bodies of concrete), service box repair lids, water meter testers (in seven models), Clark well construction, special water works gauges, the Clark inspectors' sets, and combinations of various kinds, wireless pipe locators, electric indicators, pressure regulators, aid relief valves, deep well pumps, centrifugal pumps, pump plungers, electric motors, and many other appliances.

The company also manufactures a complete line of municipal castings, and special water works and miscellaneous castings.

NEWS OF THE SOCIETIES

(*Continued from page* 395)

this would not work out. He said every city receives the police service it deserves. "A city which pays its policemen cheap salaries and forces them to work long hours gets cheap service; that's all there is to it. It is up to the municipal authorities to pay the proper salaries if they want the proper service. A man who is forced to work twelve hours on his feet is —at the end of that time—dead mentally and physically."

Raymond W. Pullman, of Washington, D. C., said that the best men could only be secured by bidding for them, and that no city can put forth the proper bid and can expect the best if it does not put up the proper amounts in salaries. "The educational standard in police departments may be a good thing, but I don't believe it necessary," said Mr. Pullman. "For instance, I have known men with good educations who were dull and of little value in a general way in police work. No man can put forth his best efforts if he is not contented, and a man cannot be contented if, because of poor pay, he incurs debts and must worry about those debts."

William A. Pinkerton, principal of the Pinkerton National Detective agency, spoke on the inadequate experience of federal agents attached to the Secret Service during the war. He said: "Persons to perform important government secret service work in the army and navy intelligence departments were selected from among doctors, bankers, merchants, architects, etc., and I am creditably informed that of these less than 1 per cent., or one person in each 100, had previous police or detective experience. The limited results achieved by these hastily organized intelligence, or secret service departments, are known to you through your almost hopeless efforts to co-operate and assist these inexperienced forces. A federal force of trained detectives that will centralize, connect up and weave together data gathered by its representatives east, west, north and south would soon eradicate such elements and persons as required the attention of our courts."

Detroit was named for the 1920 convention. Joseph M. Quigley, Rochester, N. Y., was named president of the association. Other officers elected were: J. L. Beavers, Atlanta, secretary; Fred C. Roach, Jacksonville, Fla., treasurer; Lona B. Day, Scranton, Pa., sergeant-at-arms; and the following vice presidents: August Vollmer, Berkeley, Cal., first vice president; Philip T. Smith, New Haven, Conn., second vice president; Raymond Pullman, Washington, D. C., third vice president; J. M. Broughton, Portsmouth, Va., fourth vice president, and Abner Carroll, Grand Rapids, Mich., fifth vice president.

PERSONALS

Olson, Lieut. Col. Dewitt P., Engineers, U. S. A., is now appointed state highway engineer of Idaho, succeeding H. C. Allen, resigned.

Smith, R. T., formerly of Temple, Tex., has been appointed city engineer and superintendent of water-works at Waxahatchie, Tex.

White, Fred R., head of the road department, Iowa State Highway Commission, since 1915, has been appointed chief engineer of the State Highway Commission, succeeding T. H. MacDonald. He was born in 1884 and was graduated from Iowa State College in the civil-engineering course in 1907. After railroad work, he entered the service of the Iowa State Highway Commission in 1908, two years later becoming associated with the Morgan Engineering Co. In 1911 he returned to Iowa and engaged in bridge-construction work for Cerro Gordo County, afterward entering the service of the state highway commission as field engineer.

Wilson, Charles F., who has been deputy city engineer for several years at Yakima, Wash., has been appointed city engineer, succeeding N. A. Gilman, who resigned. C. de Vere Fairchild has been appointed deputy city engineer.

J. W. Howard, C. E. and E. M., has finished his service in the Ordnance Department of the Army and has resumed the practice of his profession of consulting engineer on roads and pavements, with testing laboratory in Newark, N. J., and office at 1 Broadway, New York City.

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI NEW YORK, JUNE 7, 1919 No. 23

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 8, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Editorial Notes 397
Our Annual Statistical Number—Protection and Immunity from Typhoid.

Louisville's New Pumping Station (Illustrated) 398
A thirty-million gallon vertical, triple, fly-wheel pump and the building provided to house it. Details of the construction methods and appliances.

Disinfection of Water Supplies 402
Its use in plants in all sections of the country, the effect of such use upon the typhoid death rates, and opinions of officials as to its efficacy.

Chlorination in Michigan 403
Brief statement by the state sanitary engineer, Edward D. Rich, concerning each of the thirty-six municipalities in which it is practiced.

Progress of Water Disinfection in Maryland 404
What the State Department of Health has done and is doing, and what disinfection has accomplished, are described by the chief and assistant chief engineers of the board, **Robert B. Morse** and **Harry R. Hall.**

Meters and Metering (Tables) 407
Meters 408
Number in use, frequency of reading and billing, location of meters.

Meter Maintenance 414
Cost, manner and frequency of repairing and testing.

Waterworks Office Appliances 420
Extent to which they are used by superintendents of hundreds of plants, large and small.

Maintaining Small Watersheds 420

The Week's News 423

Legal News—Notes of Recent Decisions 427

News of the Societies 428

New Appliances (Illustrated) 429

Industrial News 430

Contract News 21

OUR ANNUAL STATISTICAL NUMBER.

In this issue we publish, according to our established custom, a report for 1919 on certain features of waterworks practice. This year we have paid special attention to meter reading and maintenance, meter rates and fire protection charges, and office methods including the use of labor-saving appliances in the office. The universality of the interest that this should have for waterworks men is indicated by the fact that more than 98 per cent of the plants report the use of meters.

In almost equally as general practice is the sterilizing of water, and the symposium of data on this rapidly developing feature will undoubtedly prove valuable to all.

PROTECTION AND IMMUNITY FROM TYPHOID.

A prominent sanitarian, in discussing typhoid fever with the writer, remarked that he had recently visited his childhood home and renewed the surprise that occasionally came over him that he had ever survived that childhood; for he found there many of the conditions which his present knowledge told him were almost sure, sooner or later, to spread typhoid fever. Asked how he and his family and neighbors had escaped it, he replied that the answer was, in his opinion, two-fold: Immunity and they didn't. He believed it extremely probable that most babies living under such conditions contracted typhoid in a more or less mild form; the robust ones recovered, the weaklings died. Probably most of the children that survived had several attacks and acquired a cumulative immunity which protected them for the rest of their lives.

There are several points arguing for the correctness of this opinion. Millions of people in Asia and Europe escape typhoid under conditions that would surely breed a pestilence in this country, and the only apparent reason is immunity, both inherited and personally acquired. Again, removal of dangerous conditions, decrease of immunity, and a decrease of more than fifty per cent in the infant death rate, have progressed together; the survival of infants not subjected to typhoid and therefore not immune probably being the cause and effect that connects these three facts.

If this be a true diagnosis, then we as a nation, by minimizing danger of typhoid, are lessening our immunity and thus rendering ourselves more subject to epidemics if at any time the protection should be withdrawn. This might be used as an argument against anti-typhoid precautions; but the answer to this is that by such precautions we save millions of children who would otherwise die in carrying out the immunity program. Also the race probably is lessening its resistive powers through

many of the changes of mode of living that are part of modern civilization; and we are not ready to abandon these, also. In fact, an important change, increasing density of population, can not be removed except by a long-continued world war or by pestilence.

More protection, not less, is the only defensible course. If we are becoming more susceptible to typhoid, then we must take more precautions against chance typhoid infection. One of the most important moves is to reduce the waves of "summer typhoid" that are due to unsanitary conditions at summer resorts and summer homes; to the "old oaken bucket" from which the automobilists drink along the roadside. This must generally be attended to by state health boards, and it is most important at this time that in every state of the Union more power be given to and wisely exercised by such boards.

LOUISVILLE'S NEW PUMPING STATION

To House Latest Increase to Pumping Plant—Thirty Million Gallon Vertical, Triple Flywheel Pump —Contractor's Methods and Plant Used in Sinking Caisson and Erecting Building.

Louisville, Kentucky, draws its water supply from the Ohio river, on the bank of which are located the pumps which raise it to the filtration plant on Crescent Hill. The plant had been enlarged a few years ago, but the increase in consumption had practically caught up with that in the pumping capacity during 1917, and another increase in the latter was found to be necessary.

The maximum theoretical pumping capacity of the plant at the river is only 70 million gallons in 24 hours and the real maximum attained is about 56 or 58 million gallons with all pumps going, even after the completion of a new 48-inch rising main. During occasional periods of a few hours each there has been a consumption by the city at the rate of more than 70 million gallons. While the city has a good reservoir capacity, had any of the pumping units been compelled to shut down for any length of time by an accident, the whole water system would have been seriously incapacitated.

To meet this condition, a contract was entered into last year for a new Allis-Chalmers pump, vertical, triple-expansion, crank and fly wheel, of 30 million gallons capacity. A few years ago one of the two pumping stations at the river had been arranged to receive an additional 30-million-gallon turbine centrifugal pump; but the pump of this type already in operation lifted only 220 gallons of water per pound of coal last year, as compared with 650 to 700 gallons pumped by the reciprocating engines operating under the same conditions and, chiefly on this account, it was decided not to install the second turbine centrifugal pump originally provided for, but to secure a vertical crank-and-flywheel pump, for which a new building was necessary.

In designing the new pumping station, there were kept in mind the needs for future increase in capacity, for more efficient screening facilities than at present, and for the most convenient location with reference to the intake and suction line. An intake tower had been completed in the river in 1914 and it was found that a new station could be located near the two old ones and obtain water conveniently through this intake tower. It was accordingly located on the east side of station No. 2 and made very similar to it in appearance and symmetrically located with reference to the intake tower. By this location it was possible to so build a cofferdam used for constructing the new station that the connecting of the new intake lines to the old suction could be performed inside of this cofferdam.

The station was planned and constructed so as to provide for two 30-million-gallon vertical pumps, although only one is being installed at present.

In addition to the pumping plant, there is being constructed a new boiler house, to contain six 400 H. P. water-tube boilers with chain grates, soot blowers, and superheaters, and a complete coal-handling and storage system whereby the coal will be unloaded automatically from railroad cars, crushed and conveyed to bins above the boilers. Two boilers were purchased from the Henry Vogt Machine Co. in November, 1917, provided with Illinois chain grate stokers, Vulcan soot blowers and Foster superheaters, but the war prevented delivery until October, 1918. Meantime two more boilers had been purchased from the Babcock & Wilcox Co., to be delivered in March, 1919.

The Vogt boilers were erected just outside the west walls of the existing boiler house and covered with a temporary wooden shed, while plans were being prepared for a new boiler house. Bids were received for this house in November, 1918, but were so high that the board decided to build the structure on a cost-plus-percentage basis, the work being given on that basis to the contractors for the pumping station, who began work on the excavation last December. It is expected to finish the boiler house this season at a cost of about $175,000.

Pumping station No. 2 and the new station stand side by side, about 40 feet apart in the clear, on the south bank of the river. They are connected by an enclosed bridge or passageway at the main floor level. The new station consists of a sub-structure about 80 feet square resting on a caisson 90 feet square and supporting a superstructure 75 feet square, on which is a pyramidal roof with slopes of 45 degrees. A bridge 70 feet long connects the main floor of the building with the embankment to the south, affording access and also carrying the discharge mains (two 42-inch pipes) and the steam pipes.

North of the main substructure, between it and the river, is a suction well, the pump well being a dry well, in which respect it differs from the old pumping station. In the suction well are supplementary screens with provisions for cleaning them, valves for controlling the distribution of the intake water, and a small traveling crane to raise and lower the screens for cleaning or repairs. These screens permit a more efficient screening of the intake water, excluding the mud and rubbish from the main pump pit. In the main building is a 30-ton crane which spans the whole engine room, provided for installing the heavy pump parts and handling them later for repairs; the crane being used also by the contractors for removing their equipment from the building and installing the main floor.

The caisson is 33 feet deep, and is covered with two feet of reinforced concrete floor forming the bottom of the main pump pit. The suction well extends 10½ feet below this into the caisson. Entering the north wall of the suction well are four 36-inch intake pipes, each of which carries a 36-inch double-disc gate valve which is electrically operated and controlled from the screen room above. Just outside the suction well, these four pipes connect in pairs to two 48-inch pipes leading from the intake tower.

The substructure is 49 feet high and contains no openings, as the river has been known to rise to nearly the level of its top. In order to resist the pressure of flood water on these walls, the plan was adopted of making the interior of the substructure circular and the outside square, the corners being cored out with a circular well 9 feet in diameter at each corner. The concrete walls were reinforced with 1-inch deformed steel bars, both horizontal and vertical, spaced about 18 inches on centers, at both inner and outer surfaces, the principal functions of which are to prevent shrinkage or settlement cracks which would let in water and to stiffen the arch ring. The top twelve feet of the substructure consists of plain walls 4½ feet thick. The substructure was faced on the outside with pitch-faced stone ashlar corresponding to old station No. 2.

The superstructure consists of reinforced concrete walls with a 6-inch veneer of pitch-faced ashlar and containing nine large windows and a large entrance door on the main room, and two windows in the screen room bay at the north and a door in the north wall opening onto a small balcony that overlooks the river. The roof is covered with red tiles of the interlocking type. A steel frame balcony with a concrete slab floor encircles the engine room 24½ feet above the floor; the balcony being 3 ft. 10 in. wide except at a few points where it is 5 ft. 4 in. A spiral stairway connects the balcony with the main floor and continues down into the pump pit.

The passageway connecting the new station with No. 2 consists of a concrete slab and tile floor, hollow terra-cotta tile walls faced with thin stone ashlar on the outside, and a reinforced concrete flat slab roof, all supported by two steel girders 43 feet long and 19 ft. 6 in. between centers, encased with a 3-inch facing of concrete with moulded panels. These girders were calculated to carry 100 pounds per square foot of floor in addition to the dead weight.

The contract for the building was let in October, 1916, to the Fruin-Colnon Contracting Co. and the Missouri Valley Bridge & Iron Co., jointly, which began actual work early in 1917 and have just about completed the construction. By December, 1917, the pump well walls had been finished 18 feet high and work was stopped for the winter. In February a flood carried away much of the docking, etc., and work could not be renewed until April, 1918, since when it has been carried on continuously.

The contractors began paying labor 25 cents an hour, advanced this to 30 and then to 40 and 45 cents, but even this did not bring enough men, and the waterworks board decided to allow the contractors such sums as represented the difference between the price of labor and cost of materials then prevailing and those that it would be necessary to pay to expedite the work; this sum being estimated at $10,000. This seemed necessary because of the urgency of having the new pump in service this summer.

After considering four types of foundation——open excavation in a steel sheetpile cofferdam, with wood pile foundation; a wooden pneumatic caisson; a combined wood and concrete open-dredging-well caisson; and an all-concrete open-dredging-well caisson—the last was selected. As to the first, it was estimated that not enough piles relying on friction could be driven within the area

GENERAL VIEW OF NEW PUMPING STATION.
Station No. 2 in the background. Girder bridge to embankment, with steel girders enclosed in concrete with panel effect.

18-INCH SUCTION PIPES. NEW PUMPING STATION.

to support the weight of building and pumps, and the open excavation would endanger the other buildings. A steel sheetpile cofferdam would require about 833 tons of sheet piling and bracing and, assuming a fair salvage price, would alone cost about $50,000. A wooden pneumatic caisson had been used for building station No. 2 and found to be too flexible for an engine foundation and also very expensive, besides which it probably could not be made sufficiently water-tight to permit obtaining a dry pump well. The concrete caisson would be built of materials all of which could be obtained easily in the local markets, it could be constructed on the surface of the ground in the dry directly over the location where it was to be sunk, and the entire structure would be permanent. The difficulty of sinking so large a structure to such a depth and bringing it to its final position perfectly level and without shifting horizontally was realized but did not seem to be insurmountable. (As a matter of fact, the caisson shifted toward the river about 15 inches during sinking, probably on account of the high embankment immediately south of it.)

As finally designed, the caisson was 90 feet square and 33 feet deep and contained 16 octagonal dredging wells in the main body and two rectangular wells in the suction-well extension. Provision was made for converting the caisson to a pneumatic caisson if necessary. It was designed to contain 5,858 cubic yards of concrete, 290,000 pounds of reinforcing steel and 159,000 pounds of steel cutting edges, giving it a total weight of 23,193,800 pounds. It was reinforced on all surfaces, both interior and exterior, by one-inch deformed bars, spaced 18 inches between horizontal and about two to three feet between vertical bars. Diagonal bars were introduced between the wells to tie the whole structure together.

Before sinking the caisson, interlocking steel sheet piles were driven on an east and west line south of the new structure and on a north and south line between it and station No. 2, these being for the purpose of preventing any movement of soil under the old station or from the embankment on the south. These piles were driven to a depth of fifty feet below the ground surface, or eight feet below the bottom of the final location of the caisson. The site of the new building was enclosed on the other two sides with an earth puddle cofferdam with wooden sheet piling, carried eleven feet above ordinary level in the river, although twenty-six feet below the highest known flood.

Meantime the contractor had built two trestles for carrying narrow-gauge construction track, one on the east and the other on the west of the building site and meeting in a Y on the embankment on the south, from which point the track ran to a storage yard and railroad siding. Two stiff-leg derricks were placed adjacent to the east trestle, one over the northeast corner of the cofferdam and one just north of the Y, while on the west trestle was placed a revolving crane or "whirley." These derricks were supported on wooden piles at the level of the railway trestles. Their booms were long enough so that their combined sweep covered all parts of the building site. They were equipped with orange-peel and clam shell buckets for excavating under the caisson through the dredging wells.

A concrete mixing plant was constructed near the north-east corner of the cofferdam, with a concrete elevator tower, sand and gravel hoppers and an inclined railway running from the concrete mixer serving platform to a cement storage barge moored in the river. Fifteen or twenty sacks of cement could be brought at a time from the barge to the mixer by means of this railway. The sand and gravel hoppers were loaded by a derrick boat from barges in the river. The tower was 112 feet high and provided with steel trussed chutes by which the concrete could be discharged into any part of the caisson.

After the derricks had been erected, the ground was leveled off to receive the caisson, and underground obstructions such as old piles, sunken trees, etc., were explored for and removed.

PUMP WELL COMPLETED.
The concrete has reached the main floor level.

NEW PUMPING STATION NEARING COMPLETION.

The cutting edges of the caisson were put in place and riveted during May, 1917, the wood forms for the concrete sides were carried up about fifteen feet, and the filling of them with concrete began on May 30th, and continued night and day (save for a few minor delays such as breaking down of the mixer engine) until June 6th, when the caisson wall had been brought up to a height of fourteen feet, when it was allowed to stand and harden before sinking the caisson.

Excavating in the dredging wells was begun on June 15th, using one-yard orange peel and clam shell buckets. The material so excavated was deposited in dump cars having a capacity of four cubic yards which were run on the construction tracks carried by the trestles previously referred to and hauled to a depression about four hundred feet south of the building. The excavated material was mostly fine sand and river mud at the top, growing coarser as the excavation proceeded and finally running clean sand and gravel with small boulders. Later the outside and interior walls were carried higher, the caisson meantime being sunk a little at a time, until it had been lowered about thirteen and a half feet. At this time the average elevation of the ground under the middle of the caisson was about ten and a half feet below the outside cutting edges. In order to settle the caisson, the walls were finished to their full height, both outside and interior. Toward the end of the operation, material excavated in the outside wells was deposited in the center wells so as to level up the surface of the ground under the caisson. When the caisson was within three feet of its final position it was jetted down the remaining distance, since the sinking could be controlled better in this way than by bucket excavation. The sinking was stopped three inches above the designated elevation, as it was expected that a slight settlement would take place due to the weight of the structure. The interior dredging wells were filled with dirt up to the under side of all the interior cutting edges, so that each well could be filled with concrete without its flowing to the other wells.

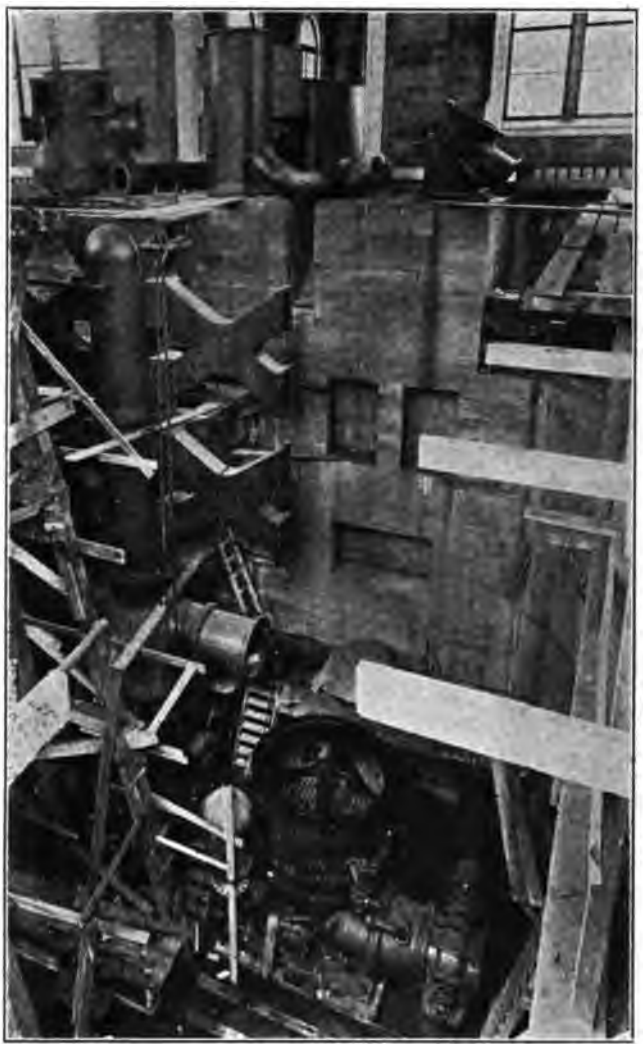
SOUTH ELEVATION OF NEW PUMPING STATION.
Shows passage between new and old stations.

PROGRESS OF PUMP ERECTION ON MAY 1, 1919.

THE THREE FLAT VALVE DECKS IN POSITION.

Before the caisson was filled with concrete, water was allowed to rise in the cofferdam until it came to the top of the caisson, so as to balance all forces as much as possible. Concrete was then placed to a depth of six feet in the bottom of each well, being placed under water by use of a tremie. Following this, a second concrete seal four feet thick was deposited. The wells were then pumped out and concreted up to within one foot of the top. The small amount of water leaking up through the concrete was confined to one side and removed with a siphon. When the well had been filled to its proper height, pipes were inserted in the concrete over the leaks and grout forced in under pressure, which effectually sealed the leaks. Following this, a reinforced concrete floor two feet thick was placed over the entire caisson, except the screen-well bay, this work being begun on October 11th, along with constructing the main substructure walls.

The walls of the substructure were constructed by setting four or five courses of stone and then backing up to this height with concrete. Work closed down on November 19th and was resumed on March 22, 1918. When the substructure had been completed to the eleva-



PROGRESS OF PUMP ERECTION IN APRIL.

tion of the main engine-room floor, the "whirley" was moved from the west trestle into the center of the building, where it was used in erecting the main walls of the station and also the steel roof.

The main house walls were carried up in the same way as the substructure, a few rows of outside stone being laid, forms being placed inside, reinforcing steel put in place, and concrete poured between the facing stone and the forms. Erection of the steel roof trusses was started on November 22nd and completed on December 22nd, and by January 10, 1919, the roof was sufficiently covered with tile to be practically water-tight and temporary heating coils were placed in the building so that the interior work could be carried on during cold weather.

The only accidents or other interference with the regular procedure of the work were a breaking of the concrete mixer engine; the collapsing of the derrick on the northeast corner; the settling of the piles supporting the "whirley," necessitating the driving of longer supplemental piles (the settlement probably being due to the excavation of the material inside the caisson); the breaking of a goose-neck on the southeast derrick and later the breaking of a boom on the same derrick. Considering that this work covered a little more than two years of almost continuous construction, and that these breaks were of minor importance and resulted only in delays of two or three days each, this record seems to be a very good one. The caisson drifted about fifteen inches north during settling, but sufficient allowance had been made in the size to permit locating the building itself on the lines originally intended.

The pumping station is now completed so far as is possible before the work of erecting the pump has been finished, and such erection had, about a month ago, progressed to the point shown in one of the photographs on the previous page. The chief engineer and superintendent, James B. Wilson, hopes to start the pump in operation by the first of July.

DISINFECTION OF WATER SUPPLIES

Opinions of Its Value by Water Works Officials in All Sections of the Country—Used Alone as the Sole Guard Against Typhoid, or in Connection with Filtration as Additional Safeguard.

The most outstanding and important development in municipal water supplies during the last decade has been the rapid and general adoption of disinfection (also called sterilization) accompanied by a perfection of methods. So far, chlorine, in the form of either hypochlorite or liquid chlorine, is the agent used in all but a few municipalities, although other methods are theoretically effective and the practical details for use in service have been worked out, and such use has been initiated.

Concerning the value of the use of chlorine, there seems to be practically but one opinion, expressed with different degrees of enthusiasm, according to the nature of the one giving it or his individual experiences. Many of these opinions will be quoted in this article.

A few weeks ago we wrote to a number of health and water works officials, asking for data concerning the use of disinfectants in their respective cities, and their opinions as to the advantage of such use. The data are best presented in the form of a table, and owing to the considerable amount of tabular matter in this issue, it seems best to defer this to next week's issue.

A number of typical opinions submitted by the officials questioned are given herewith.

NEW ENGLAND.

Rutland, Vt.: "We have had no cases that we could trace to the water supply since use of bleach was begun in 1910. All imported or contact cases, which could be identified as such. We are now using chlorine gas, which we find cheaper and more satisfactory. There is no doubt of the efficacy of the chlorine treatment of water." Dr. Charles A. Gale, President, Board of Health.

New Haven, Conn.: "It is indispensable for the water supply of the city of New Haven."

MIDDLE ATLANTIC.

Yonkers, N. Y.: "It (the use of liquid chlorine) enables us to operate the slow sand filters at a higher rate per acre per day than would be allowable otherwise. This is, of course, true of chlorination in general.

"It is more reliable, (compared with hypochlorite,) because:
(a) It is uniform in strength and practically 100% pure.
(b) It does not lose its strength, as hypochlorite does, both in the solid form and in solution.
(c) There is no residual sludge.
(d) There is no clogging of tubes and orifices.
(e) There are no fumes and dust.

"It requires very small space.

"It is simple, and easy to operate and regulate.
"It requires much less attention than hypochlorite and hence, is cheaper to operate
"It is therefore more positive in its operation and effect."

Trenton, N. J.: "When commission government took hold of the city, late in 1911, we were using the raw Delaware water for drinking purposes, and our typhoid rate was very high, (23 to 35 deaths a year). The new commission immediately started to treat our drinking water with hypochlorite of calcium and made arrangements to build a rapid sand filtration plant. You will note the marked decrease in typhoid since these measures were first started late in 1911. (The deaths fell to 20 in 1912, and 6 in the following years, and 3 to 6 after the filter was in use). We have nothing but what is good to say of the use of chlorine in the water." Dr. A. S. Fell, health officer.

Philadelphia, Pa.: "The use of chlorine as a sterilizing agent is desirable as affording an additional precaution against possible pollution where filters are operated at the high rate demanded of the Philadelphia plants. Liquid chlorine is preferable over hypochlorite of lime for the following reasons:
"1.—Economy of space for storing chemical containers.
"2.—Economy of space for apparatus applying sterilizer.
"3.—Economy of installation.
"4.—Economy of maintenance charges."—C. E. Davis, chief of Bureau of Water.

SOUTH ATLANTIC.

Baltimore, Md.: "The evidence available points to use of chlorine in the water supply from 1911 to 1915 as playing an important part in the reduction of the typhoid fever rate. Since 1915, when the filtration plant came into use, post-filtration chlorinization of the water has probably been of protective value at all times, and of positive protective value at certain times."—W. T. Howard, assistant commissioner of health. The writer calls attention to the undoubted influence of the new sewerage system in Baltimore, control of milk, reduction of flies and decrease of typhoid in rural Maryland in lowering the typhoid rate in that city. (Reducing typhoid in Maryland is described in an article in this issue.)

Talladega, Ala.: "During November and December, 1916, the chlorinating plant was not in operation, and the number of cases of typhoid fever and dysentery immediately increased." —W. E. Burt, city and county health officer.

CENTRAL STATES.

Grand Rapids, Mich.: "It is questionable whether we could meet the U. S. Treasury standard of bacterial removal and colon content at all, without its use, or only at the expenditure of much larger quantities of alum than are now required. (The water is filtered as well as chlorinated.) We consider it absolutely indispensible to the safety of the small supply, where more extensive treatment is not desirable or possible." —Walter A. Sperry, chemist of filtration plant.

Cincinnati, O.: "The cost of disinfection with liquid chlorine was only 15 cents per million gallons in 1918. We consider the use of chlorine as an added precaution to insure the safety of a drinking water. Its use, in our case, had another advantage—it prevents the growth of miscroscopic plant and animal life in our clear-water reservoir during summer.

"Our laboratory data show that our unsterilized filtered water, although of very low and satisfactory bacterial content, has 78% of its total number of bacteria, and 71% its colon bacilli removed by chlorination."—C. Bahlman, chief bacteriologist.

Terre Haute, Ind.: "We favor the use of chlorine more in our case as a precautionary measure, although it permits a reduction in the use of coagulant, and at the same time insures a more uniform supply."—W. H. Durlin, assistant manager.

Quite a number—possibly a third—of the health officials report that few, if any, cases of typhoid in their cities are derived from the water supply, or were so derived before the use of chlorine was begun; but the chlorine is employed as a safeguard against possible contamination of the water, such application being easily and inexpensively made.

The value of chlorination as permitting a reduction in the amount of coagulant in the filtration process is referred to by several. Such reduction effects an economy which will partially, if not wholly, offset the cost of applying the chlorine. It would seem, however, that this would be possible only where the amount of coagulant is regulated by the reduction in bacteria, rather than by that in suspended matter.

CHLORINATION IN MICHIGAN.

Applied to Ninety Per Cent. of the Water of Public Supplies — Comments by State Sanitary Engineer on Its Uses and Effects.

Thirty-six Michigan municipalities treat their public water supplies with chlorine, either as liquid chlorine or as hypochlorite. Beginning with January 1st, 1916, monthly reports covering the daily operation of each plant for the previous month have been required by the State Board of Health. Through the courtesy of Edward D. Rich, state sanitary engineer of Michigan, we have received information concerning these supplies, which is presented briefly in the following paragraphs:

Adrian: Population, 11,662. Liquid chlorine since March, 1916. A more or less out-of-date and crude form of filtration has been maintained by the local water company since 1898. Subsequent to 1916, more careful attention has been given to its operation, and some improvements have been made. Chlorination has been used as an adjunct since March, 1916.

Alpena: Population, 13,480. Hypo. in February, 1913; liquid chlorine since October, 1915. This source of supply comes from Thunder Bay. Water receives the untreated sewage of the entire city, and is of quite shallow depth. Considerable trouble has been experienced from turbidity, and the water has a high organic content. Hypo-chlorite treatment was used from 1913 to 1915, with very poor results, because it was not given proper supervision, but since 1915 the results have been better, probably due more to careful supervision than to a change to liquid chlorine. Objectionable tastes have always been present on account of high organic content, and the large proportion of wooden mains. An improved water supply for Alpena is under consideration. Filtration has been recommended.

Ann Arbor: Population, 15,072. Hypo. in 1912; liquid chlorine since June 15, 1915. Part of the supply is taken from wells, and the remainder from the Huron river, the river portion being chlorinated. On account of high organic content and indifferent attention, the results have been disappointing. Objectionable tastes have probably played some part in the lack of efficiency. Wells are being developed which will eliminate the necessity of using river water.

Battle Creek: Population, 30,900. Hypo. in 1912; liquid chlorine since April, 1914. Most of the supply comes from deep wells and is used untreated. During the summer when the demand is high, some water is pumped from Goguac lake, near the city limits, which is used to a great extent as a summer resort and also carries a very high organic content. We have reason to believe that chlorination has been successful in this instance.

Bay City: Population, 48,835. Liquid chlorine since April, 1919. The supply is taken from two points in Saginaw Bay, and one point in Saginaw river, and is too highly polluted to be rendered safe by chlorination without excessively disagreeable tastes. The bay receives the sewage from Saginaw and Bay City. A severe epidemic of typhoid prevailed in 1916, which resulted in the installation of a chlorine apparatus. Filtration is under consideration. The city water supply is not supposed to be used very extensively for drinking purposes.

Cadillac: Population, 10,351. Liquid chlorine since January, 1919. This supply is taken from a small lake on the edge of town, which receives storm water from the streets, but no sanitary sewage, and carries a high organic content. Tests covering a number of years have shown the presence of B. Coli almost constantly, but we believe that this supply has been safer than most waters giving the same analytical results, because of the nature of the contamination. A number of private wells are in use, and I hardly think it fair to charge the entire typhoid record to the city water supply. Chlorination has just been provided for.

Detroit: Population, 900,000. Chlorination of the Detroit supply receives most careful attention at the hands of the local authorities and we believe is of maximum efficiency. Filtration is under consideration.

Escanaba: Population, 16,525. Hypo. since September, 1914. This supply is taken from Little Bay de Noc, an arm of Green Bay, which is polluted by the sewage of Escanaba and Gladstone. The typhoid rate was exceedingly high until filtration was installed in 1909, which immediately cut down the figures to a more reasonable amount. Hypochlorite has been used as an adjunct to filtration since 1914. I do not believe that it is fair to charge all of the typhoid cases since

1909 to the city water supply, for private wells are quite extensively used, and there is a good chance for imported cases, Escanaba having the only hospital facilities available for a large portion of the upper peninsula.

Flint: Population, 60,000. Liquid chlorine since January, 1916. The water supply is taken from a river which is very heavily polluted above the city. The filtration plant was built in 1912 and 1913, and chlorination has been used as an adjunct since January, 1916. The high rate for 1916 is probably quite largely due to a severe milk epidemic in the early months of that year. It is quite possible that the high rate for 1917 might be due to some similar cause, or it may appear in a false light on account of the rapidly increasing population of the city, which we are unable to determine accurately. The growth of Flint has been most remarkable. The population in 1900 was about 13,000. The automobile industry started to boom in 1905 and 1906, and a population of about 24,000 is recorded in 1906. In 1910 the census shows 38,550. This rate projected ahead to 1918 gives an estimated population of 60,000, and 90,000 is claimed. It has been impossible for the municipality to keep pace in sanitary matters with its rapid growth, but I believe it can be safely said that filtration and chlorination have done valuable work.

Gladstone: Population 5,123. Hypo. since December, 1913. The supply is taken from Little Bay de Noc and is subject to pollution from the sewage of the city. Chlorination seems to have been effective.

Grand Rapids: Population 150,000. Hypo. in January, 1913; liquid chlorine since February, 1918. The advent of filtration and sterilization on January 1, 1913, has produced very satisfactory results.

Hillsdale: Population, 5,257. Liquid chlorine since September, 1917. This supply is taken from a small lake which is subject to summer pollution from campers, and winter pollution from ice cutting operations. Chlorination has been installed as a precautionary measure.

Highland Park: Population 40,000. Liquid chlorine since June, 1915. This municipality is within the limits of the city of Detroit, although it has its separate government. Its water comes from Lake St. Clair, which is always subject to some pollution, and to considerable turbidity. Chlorination seems to have been effective, although it has not been supervised as carefully as is possible. The construction of filters is under way.

Ironwood: Population, 14,821. Hypo since November, 1917. The supply is taken from a river which is subject to some rural contamination, and carries a high degree of color and some turbidity. The filter plant installed in 1914 was never of adequate size, and chlorination was adopted as an assistance to the filtration process. This is a mining district and it is doubtful if all the typhoid should be charged to the water. A new filter plant is under consideration.

Ludington; Population 11,334. Hypo. since 1912. The supply is taken from Lake Michigan and is subject to sewage pollution from the city. A broken intake in 1912, and possibly in 1911, added to the chance for contamination of the water. The record of Ludington is one of the best instances of the efficiency of chlorination alone.

Manistique; Population 4,890. Liquid chlorine since October, 1918. Manistique is a small place and the occurrence of a death or two a year has a very marked effect on the curve. This is not regarded as a particularly dangerous supply, but chlorination has been used as a precautionary measure.

Marine City; Population 3,778. Hypo in December, 1913; liquid chlorine since October, 1918. This supply comes from the St. Clair river, which is contaminated by the sewage from St. Clair and Port Huron. Hypochlorite has been used since December, 1913, with exceedingly poor supervision, if any at all. Liquid chlorine with laboratory control has recently been installed and we are hopeful of better results in the future.

Marquette; Population 12,681. Hypo July, 1911 to December, 1913; March, 1915, to June, 1915; January to May 1916; since November, 1916. Liquid chlorine since March, 1917. The city maintains a laboratory and chlorination is used whenever the results of analyses indicate its necessity. The intake extends about 3,000 feet into Lake Superior into 70 feet of water. The extension of the intake some years ago probably resulted in improved conditions. High rates for 1910, 1911 and 1912 are not explained. A broken intake discovered in about 1908 or 1909 was doubtless responsible for high figures at that time.

Menominee; Population 8,586. Hypo in March, 1910; liquid chlorine since October, 1916. The supply is taken from Green Bay, which is subject to sewage contamination from Menominee and Marinette, Wis. The use of hypochlorite seems to have been responsible for a material reduction in the typhoid rate.

Monroe; Population 7,928. Hypo in August, 1915; liquid chlorine since October, 1915. The supply is taken from the western end of Lake Erie and is subject to sewage contamination from Monroe and possibly from the Detroit river. Quite a serious epidemic occurred in 1915 due to sewage pollution of wells and of the city supply. The use of chlorination seems to have had some effect, but this supply can never be properly treated except by filtration.

Munising; Population 4,180. Hypo October, 1913, to November, 1915; liquid chlorine since November, 1917. The water supply was formerly taken from a shallow depth in a small bay, which received municipal sewage, but was extended two or three years ago to Lake Superior at a point where it is likely to be polluted by sewage passing out of the bay. Chlorination has not received proper supervision and its results have been unsatisfactory.

Negaunce: Population 11,677. Hypo in January, 1914; liquid chlorine since October, 1917. The supply is taken from a small lake on the edge of town which is subject to pollution from miners' homes in the vicinity. Chlorination seems to have been effective. The high rate in 1917 was due to an epidemic traced to ice cream.

Niles; Population 5,843. Liquid chlorine since January, 1918. Chlorination has been in use too short a time to admit of any conclusions.

Petoskey; Population 4,250. Liquid chlorine since August, 1918. Chlorination has been in use too short a time to admit of any conclusions.

Port Huron; Population 18,618. Hypo in June, 1912; liquid chlorine since June, 1914. A severe epidemic at Port Huron in 1912 resulted in the installation of hypochlorite treatment, with good results. It has not received as perfect attention as we hope it will in the future.

St. Clair: Population, 2,633. Hypo. in May, 1913; liquid chlorine since November, 1917. The supply is taken from the St. Clair river, which receives the sewage from Port Huron. Chlorination has been a remarkable success in this case.

St. Joseph: Population, 6,759. Hypo. in July, 1912; liquid chlorine since November, 1917. The supply is taken from Lake Michigan and is subject to sewage pollution from St. Joseph river. Chlorination seems to have been effective.

Sault Ste. Marie: Population, 14,339. Liquid chlorine since June, 1918. Chlorination was installed so recently as to make conclusions impracticable.

South Haven: Population, 3,317. Hypo. since April, 1912. The supply is taken from Lake Michigan and is subject to sewage contamination. The city does a large summer resort business, and it is quite possible that the higher rates in 1914 and 1916 were due to imported cases.

Traverse City: Population, 14,346. Hypo. in February, 1913; liquid chlorine since May, 1916. The supply is taken from Little Traverse Bay, which is subject to sewage pollution. I do not believe that the increase in rates for 1916 and 1917 is entirely chargeable to city water.

Trenton: Population, 1,256. Liquid chlorine since January, 1918. The supply is taken from the highly polluted Detroit river, and until January, 1918, was used without treatment. The low rates in 1905, 1910, 1912, and 1914 were probably due to the immunity developed in the inhabitants by the constant drinking of diluted sewage.

Wyandotte: Population, 12,103. Hypo. since April, 1914. The supply is taken from the highly polluted Detroit river, and its purification has been attempted by means of chlorination, without success for the reason that such disagreeable tastes and odors are caused. An extension of the intake and a filter plant are now under construction. Investigation of typhoid fever cases in 1916 showed that many of the patients were people who had recently moved to Wyandotte.

Further data concerning the Michigan cities will be given next week, showing the effect of the sterilizing treatment. With this will be given also data concerning the results of operation in other cities.

For keeping in touch with the operation of these plants, the state board requires each plant to send to it, once a month, a daily record of the amount pumped, amount of chemical applied, turbidity and oxygen consumption of raw water; the 20 degree and 37 degree count of bacteria in raw and treated water, and the results of tests of both raw and treated water for gas formers. It is also made obligatory that the board be notified immediately in case the flow of sterilizing agent is discontinued for more than twenty-four hours.

PROGRESS OF WATER DISINFECTION IN MARYLAND.*

Need Shown by Survey by State Health Department —General Description of Plants and of Results of Chlorination.

By ROBERT B. MORSE and HARRY R. HALL.†

There are eighty-two public water supplies in Maryland, serving about 862,489 people—62.2 per cent of the estimated total population of 1,384,539. Several community systems delivering water to small groups of houses, and also institutional supplies, are not included in this number.

The state, through its Board of Health, has had, since 1914, supervisory control over the design, construction, and operation of water systems. No material extensions of, nor alterations in, existing systems can be legally made, nor can new supplies be installed, unless complete plans and specifications covering the proposed work are submitted to the State Board of Health for approval and a written permit is granted by that body. Moreover, when deemed necessary for the public health or welfare, the Board may require existing water systems extended or altered, and it is empowered to compel the installation of public supplies in communities not served. It is the duty of the corporate officers to raise the funds necessary for carrying out the work required, and they may do this, if they wish, by issuing bonds without special legislative enactment and without a referendum vote.

Broad as is the control of the state over the design and construction of water supplies, it is no more liberal than is its authority over the operation of existing systems, in so far as the public health is affected. If the State Board of Health finds that any water plant is not properly operated, it may require a change of method, and may, when necessary, force the employment of competent attendants, it even being enabled to attain this end by appointing attendants of its own selection, at the cost of the municipality or water company owning the plant. Possible arbitrary action, however, is precluded by a provision in the law allowing appeal to the local county court, before which the Board would have to prove the reasonableness of its act.

The engineering division of the State Board of Health was organized in June, 1912, under a law passed in 1910. The early engineering studies indicated plainly the need of the complete supervisory power over the water supplies of the state, and this need was satisfied by the passage of the water supply and sewerage act of 1914. In 1912, when the engineering investigations were begun, it was found that, in general, knowledge of the condition of the public water supplies in the state was meager. Analyses of the water from many of the supplies had been made occasionally, but no systematic method of examination had been followed.

The state's investigations commenced to show that many of the water systems were badly in need of attention. The surface supplies were derived from streams fed by watersheds containing habitations, in many cases providing numerous sources of contamination, and, in general, protection was not offered by long storage, filtration, or other treatment. Water was usually taken from the stream at an intake dam, and passed into a distributing reservoir of insufficient capacity to provide a safe period of storage. Moreover, water from some of the tubular well systems was found to be polluted, because the wells either were too shallow and located in the midst of thickly settled districts where sources of pollution were numerous, or were driven in rock containing fissures. Some supplies previously considered to be beyond suspicion were found, upon close investigation, to be in a bad condition and a menace to the public health.

In a number of instances where supplies were polluted, the water was satisfactory from a physical standpoint, there being an absence of color, turbidity, and other objectionable characteristics. This was naturally true in the case of most well and spring waters. The water from streams fed by mountain watersheds, and from watersheds containing much wooded or uncultivated land, was also generally in good physical condition.

Where water, otherwise acceptable, was found to be in an unsafe sanitary condition, filtration did not appear to be necessary or even generally advisable for assuring the proper degree of purity. Expense and the improbability of proper operation are two factors which would make filtration plants undesirable for many of the small systems which abound in Maryland. Consequently, disinfection was resorted to wherever it would serve the purpose. There were, however, a considerable number of surface supplies derived from streams flowing through cultivated country and furnishing a water occasionally or persistently turbid. Such supplies as these naturally require filtration. Disinfection in connection with filtration is general and is required in most new installations. While the writers' assistants have been able to obtain good results from several filter plants without the addition of disinfectants, the character of attention which small works ordinarily receive makes their use essential.

Prior to 1912, there were only four disinfecting plants in operation on water supplies in Maryland. Two of these were located on the Gunpowder river and Jones Falls systems, of Baltimore; and two, owned by the Baltimore County Water and Electric Company, were at the Avalon and Herring Run plants, which serve large sections in Baltimore County near the city. At Avalon, disinfection was carried on in conjunction with filtration. All these installations used hypochlorite of calcium, and at Herring Run ozone was employed at times.

Since 1912, many towns in other parts of Maryland have been proyided with purification plants, and it is a striking fact that, of the 862,489 persons served by public water supplies at the present time, 785,000 or 91.1 per cent (approximately 56.7 per cent of the population of the state) use water which is treated by either filtration or disinfection, or both.

Fifty-nine of the eighty-two public water supplies derive their water from underground sources. The population thus served amounts to 102,942. The number of consumers is small in comparison with the number of systems, because these supplies, in general, are located in the smaller towns. The remaining twenty-three systems take water from surface streams and serve a population of 759,547. The large population using surface water is accounted for by the fact that Baltimore and most of the other places of considerable size are thus supplied. Ground waters are used by 12.0 per cent of the people served by public systems, and by 7.5 per cent of the total population of the state. The corresponding figures for surface waters are 88.3 and 54.6 per cent.

Not only is the influence of water purification felt by the public water supplies but it has reached to state and private institutions as well. There are eight institutions, embracing a population of 4,855, where the water receives treatment of some kind, and in all but two of these it is disinfected.

*Slightly condensed from a paper presented before the New England Water Works Association, which has since been modified by the authors to bring it up to date.

†Chief engineer and assistant chief engineer, respectively, of the Maryland Department of Health.

Disinfection by means of hypochloride of calcium or liquid chlorine is naturally the most common method practiced, although there is one ozone plant which is operated in conjunction with one of the hypochlorite installations. One ultra-violet ray disinfection apparatus has already been installed and another will soon be completed. Both are to be used in conjunction with filtration.

The type of apparatus suitable for hypochlorite or liquid chlorine treatment in any particular case depends upon the method by which water is supplied. Where the flow of water to be treated is at most times substantially uniform, as in the case of certain pumping plants, or in gravity lines discharging into reservoirs, a manually controlled apparatus is sufficient. Where fluctuations occur in the rate of flow, automatic control devices are essential for proper results. Liquid chlorine plants, so-called, introduce chlorine into the water either as a gas or in solution. The gas feed, usually called "direct feed," is well adapted for use where no water under pressure, for dissolving the gas, can be obtained easily. There is one direct-feed plant in Maryland at the present time; and only one, at Perryville, is regulated automatically.

The early disinfecting plants, as stated previously, all made use of hypochlorite of calcium, and with effective results. Those on the Avalon and Herring Run supplies of the Baltimore County Water and Electric Company were the first to be installed in the state. The former was constructed in 1908, and the latter during the year following. Late in 1910 the Jones Falls supply for Baltimore was first disinfected, and in June, 1911, the Gunpowder River plant was put into use. Until 1913 these were the only installations of disinfecting apparatus used for water purification in Maryland. A filtration plant had been previously built by the Washington County Water Company, to supply Hagerstown from Antietam creek during dry periods, and hypochlorite dosing apparatus had been provided; but the disinfectant was not used until the summer of 1913. About the same time, the State Board of Health constructed a plant for the Ellicott City system. Cumberland next followed, during the fall of the same year, by putting into operation a hypochlorite plant in conjunction with the mechanical filters on its new supply. In December, the mountain supply of Hagerstown was furnished with hypochlorite apparatus. A typhoid fever epidemic at Rockville during February, 1914, made necessary the construction of an emergency hypochlorite plant by the State Board of Health, for treating the supply derived from tubular wells driven in rock and proven to be the cause of the disease. The first liquid chlorine apparatus was put into operation at Union Bridge in January, 1914, for treating about 120,000 gal. of water derived from tubular wells driven in limestone rock. An ozone plant had been installed in 1909 at the Herring Run supply of the Baltimore County Water and Electric Company, but at first it was used, so the writers are informed, only experimentally.

After the powers of the State Board of Health were broadened in 1914 and an increased appropriation was provided for sanitary engineering work, water purification plants naturally were introduced at a more rapid rate than previously.

Data concerning the disinfecting plants now in use in Maryland are shown in the accompanying table. In addition to the plants shown in this table, there are in operation several water supply systems on federal reservations in the state, which are not included in our discussions or tabulations concerning public water supply systems. These are located at the following stations: Perry Point, Camp Meade, Curtis Bay Ordnance Depot, Camp Holabird, Aberdeen Proving Ground, and Edgewood Arsenal.

Changes are taking place continually in the water supply situation in this state, and it is expected that the number of disinfecting plants soon will be increased and that alterations will be made in some of the water supplies, which will involve plants now in operation.

DATA CONCERNING WATER SUPPLY DISINFECTING PLANTS IN MARYLAND.

Place	Population (Estimated 1918)	Type of Plant	Character of Supply	Date	Average Amount Treated Daily (Gallons)	Chlorine Parts Per Million	Where Chemical is Applied	Character of Attention
Plants for Disinfection Only.								
Annapolis	8,677	Liquid Chlorine	Surface	1915	1,400,000	0.30	Pump suction	Fair
Arlington	10,000	Liquid Chlorine	Ground	1914	112,000‡	0.30	Pump suction	Good
Braddock Heights	175	Hypochlorite	Ground	1918	10,000	0.30	Pump suction	Good
Elkton	2,442	Hypochlorite	Surface	1917	250,000	0.50	Pump suction	Poor
Frederick	11,340	Liquid Chlorine	Surface	1915	1,600,000	0.35	Supply main	Good
Frostburg *	6,655	Hypochlorite	Ground	1916	300,000	0.30	Pump suction	Indifferent
Glen Echo	240	Hypochlorite	Surface	1918	20,000	0.5-1.0	Supply main	Good
Hagerstown	27,000	Hypochlorite † / Liquid Chlorine	Surface	1913 / 1914	3,600,000	0.60	Supply main	Good
Herring Run	28,000	Hypochlorite / Ozone	Surface	1909	3,000,000	0.40	Pump well	Good
Kensington	865	Liquid Chlorine	Ground	1918	50,000	0.30	Pump suction	Good
Maryland Tuberculosis Sanatorium	600	Hypochlorite	Ground	1915	60,000	0.60	Pump suction	Good
Princess Anne	1,133	Hypochlorite	Ground	1917	100,000	0.18	Pump suction	Good
Rockville	1,239	Liquid Chlorine	Ground	1916	30,000	0.20	Collecting res.	Good
Salisbury	8,696	Hypochlorite	Ground	1917	300,000	0.25	Pump suction	Good
Union Bridge	918	Liquid Chlorine	Ground	1914	120,000	0.30	Pump suction	Good
Westernport	3,288	Hypochlorite	Surface	1914	450,000	0.40	Supply main	Poor
Plants for Filtration and Disinfection.								
Avalon	32,000	Hypochlorite	Surface	1908	2,000,000	0.40	Outlet Coag. Basin	Good
Baltimore	599,650	Hypochlorite / Liquid Chlorine		1915	110,000,000	0.30	Filtered water	Good
Cumberland	26,074	Liquid Chlorine	Surface	1913	8,000,000	0.50	Inlet Coag Basin	Good
Hagerstown	27,000	Hypochlorite / Liquid Chlorine	Surface	1913	3,600,000	0.60	Filtered water	Good
Laurel	2,692	Hypochlorite	Surface	1915	150,000	0.25	Filtered water	Good
Luke	950	Liquid Chlorine	Surface	1918	160,000	0.50	Filtered water	Good
Maryland House of Correction	700	R. U. V.	Surface	1918	250,000	....	Filtered water	....
Notre Dame	353	Liquid chlorine	Ground	1915	30,000	0.25	Pump suction	Good
Springfield State Hospital	1,800	Liquid Chlorine	Surface	1918	330,000	0.30	Filtered water	Good
Takoma Park	1,646	Liquid Chlorine	Surface	1918	200,000	0.30	Filtered water	Indifferent
Westminster	3,374	R. U. V.	Surface	1918	400,000	....	Filtered water	Good

*Used during dry weather periods only—emergency supply. †Now kept for emergency use. ‡Mixed with about 231,000 gallons untreated water.

The amount of chemical used at the disinfecting plants in Maryland has varied widely according to local conditions. It has ranged from 0.2 to 3.0 parts per million of available chlorine. Where the disinfectant is applied to a spring or well water, or to the effluent from a well-operated filtration plant, the amount required is usually near the minimum mentioned above. In the case of turbid waters, large amounts have been found necessary for proper treatment, and at times of extreme turbidity even excessive quantities are inefficient. In the treatment of the Baltimore City water, as high as 3 parts per million of available chlorine, of 75 pounds of hypochlorite to the million gallons, have been used on raw water. The amount necessary in many instances depends also upon the character of attention given the apparatus.

It is by no means a fact that the disinfecting plants in Maryland have been operated with complete satisfaction, for most of them have had trouble of some kind. The difficulties encountered could generally have been avoided with more attention to proper operation. With hypochlorite plants, the principal annoyance has been due to the formation of coatings which clog the pipes; and, where the solution was particularly strong, the materials of which the piping was made have been attacked, necessitating the replacement of parts. These are not serious troubles, however, and can be eliminated by frequent inspection. In the case of liquid chlorine plants, it has been found that occasionally a part becomes corroded and requires replacement, or a valve gets out of adjustment, but the gradual perfection of apparatus is making such occurrences less frequent.

Where faithful and intelligent attention has been given to operation, and the amount of disinfectant used has not been excessive, few complaints have been made regarding tastes or odors in the water. In one instance, where a liquid chlorine plant of the manual control type was disinfecting water the flow of which fluctuated considerably, there was always an overdose at night which caused complaint due to tastes noticeable during the early hours of the day. This, of course, was the fault of the method employed and not of the treatment itself. In general, fewer complaints have been registered concerning disagreeable tastes where liquid chlorine was used than in the case of hypochlorite.

There has been a marked decrease in the prevalence of typhoid fever in some of the communities where disinfecting plants have been installed. In most cases, however, the period of operation has been so short, and, on account of the small size of some of the places, the appearance of typhoid so irregular, that records do not indicate clearly the effect produced. Moreover, much of the typhoid fever in Maryland is attributable to causes other than impure water supplies. Nevertheless, there are certain well-defined instances where a decrease in typhoid fever morbidity and mortality can be traced directly to purification of a water supply. In Baltimore, the reduction has been very pronounced. After the disinfecting plants were built, the prevaalnce of typhoid immediately fell off, and the improvement has since continued. In 1915, both the morbidity and mortality rates from this disease, although higher than in many of the larger cities of the country, were approximately half as great as in 1910. Following the introduction into Cumberland of filtered and disinfected water from Evitts creek, in place of the former raw supply from the Potomac river, the occurrence of typhoid fever was so reduced that in 1915 there were scarcely more than one-sixth as many cases of, and one fifth as many deaths from, this disease as in 1913, in spite of the fact that the corporate limits had been enlarged in the meantime. One of the most striking instances of the effect upon typhoid occurrence caused by disinfecting a water supply in Maryland was that of the Rockville epidemic, which, after twenty-eight cases had occurred, was checked suddenly by the installation of an emergency hypochlorite plant.

In order that prompt remedial measures may be instituted when a water supply is at any time found to be in an unsafe condition, or when an outbreak of typhoid fever casts suspicion on a water previously untreated, the engineers of the State Board of Health are all instructed in the setting up of an emergency hypochlorite dosing apparatus, making use of ordinary and easily obtainable materials. A sketch showing the general arrangement of the device used, including a bill of material, has been prepared, and is usually sent ahead, so that the necessary material may be on hand when the engineer arrives at his destination. This apparatus has proven its value on many occasions and several of the installations are still in operation.

Basing judgment on experience in Maryland, it may be stated that, where chlorinating plants for water supplies are given faithful and intelligent attention, their use is a success; and they provide an effective and inexpensive method for treating many water supplies which do not need filtration, as well as for safeguarding in a measure those supplies for which filtration, although desirable, is prohibitive. Unfortunately, there seems to have been some tendency among manufacturers to convey the impression that little attention need be paid to the operation of a liquid chlorine plant. This has given the operator the impression, in some instances, that the apparatus can be entirely neglected. While it is true that little or no difficulty need be experienced, except when parts give out, neglect is certain to cause irregularity in dosing, exposure in certain cases to freezing and other undesirable results. Greater efficiency from some of the disinfecting plants in Maryland is to be expected in the future, as the State Board of Health will be enabled to make more frequent inspections than in the past. This will be made possible by the fact that, in addition to the main office of the engineering division, there are maintained four offices in various parts of the state, at each of which there is a resident engineer who has direct supervision over sanitary engineering matters in his district. Without an effective system of control, disinfection would fall short of giving satisfaction in connection with many small water supplies.

WATER METER DATA.

Information Furnished by Nearly Four Hundred Waterworks Superintendents—Location, Reading, Testing and Maintaining of Meters —Cost of Meter Service.

On the following pages will be found tabulated a part of the information collected by us by means of a questionnaire, which information was furnished by nearly four hundred and fifty water works superintendents. A third table, dealing with rates, we can not find room for this week, but will give in a later issue.

The questions to which these figures were given in reply were as follows:

"How many meters have you in use?" "How many are under 1 inch?" "How often is each meter read?" "Are all consumers billed at the same time, or in rotation by districts?" "What is the average number of meters read per man per hour?" "Are meters located inside the buildings or outside?" "What is the cost of meter reading and clerical work connected with meters?" "What is the cost of repairs and maintenance per meter in service?" "To what extent are repairs made by the waterworks employes?"

(Continued on page 414)

METERS.

City and State—	Number in use	Number under 1 inch	Frequency of reading each meter.	Billing simultaneous or in rotation.	Average number of meters read per hour per man.	Meters in building or outside.	Cost of meter reading and clerical work on meter accounts.
Alabama:							
Gadsden	2,030	1,800	Monthly	Simultaneous	60	Outside	$175 per month
Talladega	630	618	Quarterly	Simultaneous	*15	Most outside	6.4c.
Arizona:							
Bisbee	None	....	.....	.....	....	....	.....
Clifton	34	22	Monthly	.....	....	Outside	.....
California:							
Alhambra	2,100	1,870	Monthly	Simultaneous	29	Outside	$2.316 per meter per annum
Anaheim	1,252	1,225	Monthly	Same time	40 light, heat and power	Outside	6c. per meter
Lodi	5	1	Monthly	Simultaneous	....	At curb	.....
Los Angeles	99,600	95%	Monthly	Rotation	50	Outside	11c., incl. collections
Oxnard	6	1	Monthly	Simultaneous	....	Outside	Negligible
Palo Alto	1,507	1,469	Monthly	Simultaneous	About 60	Outside	$1,800 per year
Riverside	598	551	Monthly	Simultaneous	....	Both	.....
Sacramento	None	....	.....	.....	....	....	.....
San Diego	15,169	14,342	Monthly	By districts	41	Outside	$240 per month
Santa Maria	550	510	Monthly	Simultaneous	20	Outside	$32 per month
Stockton	1,600	1,200	Twice a month	Simultaneous	40	At curb, but scattered	.....
Pasadena	12,547	11,436	Monthly	Rotation	38	Outside	$17,454.53 per year
Whittier	1,951	....	Quarterly	Simultaneous	18 to 20	Generally outside	.....
Colorado:							
Colorado Springs	273	167	Monthly	Simultaneous	....	Both	$20 per month
Ft. Morgan	15	10	Monthly	Simultaneous	....	Inside	.....
Greeley	249	221	Monthly	Simultaneous	12 to 15	Both	.....
Rocky Ford	720	705	Monthly	Simultaneous	20	....	.....
District of Columbia:							
Washington	61,107	57,289	Large consumers monthly or quarterly, others 3 to 6 times a year.	Rotation	22	Outside	28c. per meter
Connecticut:							
Ansonia	665	595	Quarterly	Simultaneous	12	Mainly inside	.....
Derby	262	232	Monthly	Simultaneous	....	Inside	.....
East Hartford	60	20	Every 6 months	Simultaneous	....	Inside	.....
Hartford	15,451	13,303	Monthly	Simultaneous, twice a year	12	Inside	$19,000 a year
Middletown	2,300	1,600	Monthly	Simultaneous	11	Mostly inside	54c. per meter per year
Putnam	90	About 4/5	Mostly quarterly	Simultaneous	All in less than one day	A few outside	Small
Southington	132	About 112	Quarterly	Simultaneous	8	Mostly inside	.....
South Manchester	1,925	1,784	Quarterly	Quarterly	12 to 15	100 outside	.....
Suffield	316	300	Quarterly	Simultaneous	....	Mostly inside	.....
Wallingford	318	280	Large meters every 2 months, small meters every 6 months	.....	*75	Inside and in manholes	.....
Willimantic	1,470	1,400	Quarterly	Simultaneous	15 to 20	Inside	.....
Winsted	260	207	Semi-annually	Simultaneous	15	Inside	$25 per year
Florida:							
De Land	925	900	Quarterly	Simultaneous	25	Outside	$40
Fort Myers	183	180	Monthly	Simultaneous	183 in 1 day	Outside	.....
Miami	4,500	4,260	Quarterly	Simultaneous	60	Outside	.....
Ocala	About 800	750	Quarterly	Simultaneous	10	Outside	$15 per week
St. Augustine	500	450	Quarterly	Simultaneous	12	Outside	$12
St. Petersburg	2,581	2,560	Monthly	Simultaneous	About 40	Outside	$125 per month
Georgia:							
Albany	2,000	....	Monthly	Simultaneous	20	Generally outside	5c. per meter
Americus	1,200	1,100	Monthly	Simultaneous	20	Outside	30c. per meter per year
Atlanta	33,000	....	Monthly	Simultaneous	30	Outside	80c. per meter per year
Augusta	7,500	7,300	Monthly	Simultaneous	20	Outside	12c. per meter per mo.
Commerce	360	355	Monthly	Simultaneous	20	Outside	$30 per month
Elberton	300	10	Monthly	Simultaneous	....	Outside	.....
Fitzgerald	1,100	1,094	Monthly	Simultaneous	‡280	Outside	$68 per month
Gainesville	750	740	Monthly	Simultaneous	20-25	Outside	.....
Griffin	953	901	Monthly	Simultaneous	20, electric at same time	Most outside	$57 per mo.
La Grange	1,365	1,318	Monthly	Simultaneous	By one man in 4 days	Outside	4c.
Marietta	1,120	About 90%	Monthly	Simultaneous	2 men read water & electric 250 per day	Outside	About $95 per month
Savannah	1,600	1,360	Monthly	Simultaneous	About 12	Both	About $6.24 per year
Tifton	450	400	Monthly	Simultaneous	30	Outside	$15 per mo.
Idaho:							
Coeur d'Alene	97	75	Monthly	Simultaneous	All in 1 day	Half outside, half inside	$10 per month
Lewiston	1,200	1,150	Monthly	Quarterly	38	Outside	$33.50 per month
Twin Falls	40	20	Monthly	Simultaneous	10	Outside	.....

Illinois:							
Canton	1,400	Most	Residence quarterly, business monthly	By districts	....	Most inside	.....
Champaign & Urbana	5,002	4,700	Quarterly, large consumers monthly.	Simultaneous	20	Mostly inside	.....
Chicago	26,000	5,850	Monthly	In rotation	6 to 7	Some inside, some outside	$103,406.96
Chicago H'ts	2,366	2,200	Residence quarterly, factories monthly	Residences by districts	....	Both	.....
DeKalb	1,800	1,775	Quarterly	Simultaneous	....	Some inside, some outside	.....
Downers Grove	850	840	Quarterly	Simultaneous	‡160	Both	.....
Duquoin	250	230	Monthly	Simultaneous	12	98% outside	6½c.
Lincoln	1,827	1,796	Monthly	3 districts	18	4/5 outside	.....
Mattoon	125	100	Monthly for large, quarterly for small.	Simultaneous	10	Outside	$25 per month
Mt. Carmel	25	15	Monthly	By districts	....	Mostly outside	.....
Mt. Vernon	1,313	1,263	Monthly	Simultaneous	27	Both	36c. per meter per year
Olney	530	510	Monthly	Simultaneous	20	Both	$65 per month
Paris	250	Majority	Quarterly	According to streets	....	Both	.....
Peru	1,650	1,550	Half yearly	Simultaneous	‡225	Mostly inside	$700
Princeton	1,225	1,215	Quarterly	Simultaneous	12	Inside	$150 per year
Quincy	4,826	4,680	Twice each quarter	3 districts	20	Mostly inside	$926.88 per year
Streator	2,265	2,000	Monthly	By districts	....	Both	.....
Watseka	700	600	Twice a year	In rotation	15	Both	5c. per meter
Indiana:							
Bluffton	850	840	Semi-annually	Simultaneous	10	Both	.....
Brazil	1,000	970	Quarterly, some monthly	Simultaneous	25	Mostly outside	$56.92
Columbus	90	70	Monthly	Simultaneous	7	Both	$5 per month
Decatur	950	900	Quarterly	Simultaneous	10	Both	10c. per meter
Evansville	6,098	5,794	Large monthly, small quarterly	Simultaneous	....	Both	.....
Goshen	1,801	1,705	Quarterly	Simultaneous	12	Mostly in cellars	$287.36
Greenburg	100	50	Quarterly	Simultaneous	10	Various locations	.....
Huntington	2,417	2,000	Quarterly	By districts	25	Both	.....
Jeffersonville	390	315	Large monthly, small quarterly	Simultaneous	10	Both	.....
Kendallville	1,140	1,050	Quarterly	Simultaneous	....	Both	.....
Knightstown	580	577	Monthly	Simultaneous	25	Both	.....
La Porte	264	189	Monthly	Simultaneous	12	Boxes mainly	11c. each
Lebanon	1,510	1,450	Monthly	Simultaneous	20	Outside	.....
Linton	212	201	Monthly	Simultaneous	10	Both	.....
Madison	7	1	Monthly	Simultaneous	....	Both	50c. per hour
Mishawaka	2,474	2,424	Quarterly	Simultaneous	18	75% inside, 25% outside	$802.45
Newcastle	800	775	Quarterly	Simultaneous	12	Both	7c. each
North Manchester	525	509	Quarterly	Heaviest users first and down	10	Mostly inside	$480 a year
Plymouth	803	782	Every 2 months	Simultaneous	....	Mostly inside	.....
Richmond	4,117	4,009	About 50 monthly, balance quarterly	Simultaneous	10 to 15	Mostly inside	Reading 20c. each
Seymour	140	110	Monthly	Simultaneous.	....	Both	.....
South Bend	11,000	9,500	Residence quarterly, business monthly	In rotation	15	Both	.....
Terre Haute	7,307	7,077	Monthly	Simultaneous.	25	Mostly outside	$2,178.82; 2½c. per meter reading.
Tipton	800	790	Quarterly	Simultaneous.	10 to 15	Mostly outside	$75 per quarter
Valparaiso	1,225	1,187	Monthly	Simultaneous.	20-25	Most inside	.....
West Lafayette	125	100	Semi-annually	Simultaneous	....	Inside	.....
Iowa:							
Atlantic	250	235	Semi-annually	Simultaneous	10	Inside	$40 each time
Boone	1,864	1,850	Quarterly	Simultaneous	15	Both	$300 per quarter
Burlington	210	120	Monthly	Simultaneous	10	Mostly inside	12c. per month
Cedar Falls	1,292	1,235	Monthly	Simultaneous	35	Inside	$60 per month
Fort Madison	322	296	Monthly	Simultaneous	....	Inside	.....
Maquoketa	1,000	990	Semi-annually, 10 monthly	Simultaneous except monthly readings	17	Inside	.....
Marion	890	875	Monthly	Simultaneous	30	Inside	$20
Marshalltown	2,866	2,814	Quarterly	Simultaneous	10	Inside	.....
Mason City	3,000	2,850	Quarterly	Simultaneous	15	Inside	55c. per meter per quarter
Muscatine	2,500	2,300	Monthly	Simultaneous	25	Mostly inside	$30 to $40 per month
Osceola	110	110	Monthly	Simultaneous	....	Inside	.....
Sioux City	9,709	9,616	Monthly, quarterly and semi-annually	Simultaneous	12	Both	.....
Washington	1,000	950	Quarterly	Simultaneous	8	Inside	.....
Kansas:							
Atchison	476	369	Monthly	Simultaneous	12	Both	$45 per month
Chanute	2,175	2,160	Monthly	Simultaneous	....	Both	4c. per meter per month
Cherryvale	1,050	1,038	Monthly	.....	25	Outside	$50 per month

METERS—Continued.

City and State—	Number in use	Number under 1 inch	Frequency of reading each meter.	Billing simultaneous or in rotation.	Average number of meters read per hour per man.	Meters in building or outside.	Cost of meter reading and clerical work on meter accounts.
Kansas (Continued)							
Clay Center	962	873	Monthly	.....	....	Both	$70 per month
Council Grove	263	258	Monthly and quarterly	Simultaneous	10	Both	.....
Emporia	2,500	2,400	Monthly	Simultaneous	20	Mostly outside	5c per meter per month
Fort Scott	2,000	1,900	Domestic quarterly; commercial monthly	Simultaneous	30	Both	$120 per month
Fredonia	700	675	Monthly	Simultaneous	About 30	Mostly outside	.....
Great Bend	550	500	Monthly	Simultaneous	30 water and electric	Outside	5c per meter per month
Hiawatha	709	702	Quarterly	Simultaneous	25	Both	.....
Holton	484	480	Monthly	Simultaneous	20	Inside	$25 per month
Horton	350	349	Quarterly	Simultaneous	30	Both	$50 per year
Independence	2,053	....	Monthly	Simultaneous	....	Outside	.....
Iola	800 or 900	Almost all	Mostly quarterly	.....	.....	....	.....
Larned	....	....	Quarterly	Simultaneous	30	Both	.....
McPherson	1,000	975	9 times a year	Simultaneous	20	Mostly outside	40c per hour
Manhattan	1,902	1,877	Quarterly; large consumers monthly	Simultaneous	25	Both	26c per acc't
Neodesha	950	935	Monthly	Simultaneous	30	Outside	.....
Osage City	425	420	Monthly	In rotation	20	Both	.....
Osawotamie	360	360	Monthly	Simultaneous	.....	Both	.....
Ottawa	908	890	Monthly	Simultaneous	30 water and electric	Mostly inside	5c per meter per month for water and electric
Kentucky:							
Bowling Green	250	210	Monthly	Simultaneous	20	Both	About $200 per year
Frankfort	300	....	Monthly	Simultaneous	....	Both	.....
Hopkinsville	1,174	1,152	Monthly	Simultaneous	35	Outside	2½c per meter per month
Lexington	7,300	....	Monthly	Simultaneous	60	Curb line	.....
Louisville	5,865	3,875	Monthly	Simultaneous	20	Mostly outside	.....
Maysville	115	80	Monthly	Simultaneous	20	Both	.....
Paris	50	40	Monthly	.....	....	Both	.....
Somerset	479	450	Monthly	Simultaneous	15	Both	$2 per day
Louisiana:							
Kentwood	None	....	.....	.....	....	....	.....
New Iberia	200	100	Monthly	Simultaneous	All in 3 days	Outside	.....
Shreveport	3,754	97%	Monthly	10 districts	20	Outside	.....
Maine:							
Bangor	87	24	Monthly	.....	8.7	Mostly inside	$11.25 per month
Caribou	3	....	Quarterly	Simultaneous	....	Inside	$1.00
Eastport	750	725	Large consumers monthly, small quarterly	Simultaneous	24	Inside	.....
Gardiner	42	36	Monthly	.....	....	Inside	.....
Houlton	10	2	Quarterly	Simultaneous	....	Both	.....
Lisbon Falls	300	300	Quarterly	Simultaneous	....	Inside	$50 per year
Paris	7	6	.....	.....	....	Inside	.....
Sanford	1,200	1,190	Semi-annually	Simultaneous	10	Inside	$125 per year
Maryland:							
Baltimore	4,000	3,000	Quarterly	Simultaneous	15	Both	.....
Cumberland	800	783	Semi-annually	.....	....	Both	.....
Hagerstown	4,800	4,500	Large consumers monthly, domestic quarterly	.....	10	Inside	$2,000 per year
Massachusetts:							
Attleboro	3,067	3,045	Mostly quarterly, few monthly	Simultaneous	....	Inside	.....
Barre	25	23	Semi-annually	Simultaneous	....	Inside	.....
Belmont	1,712	1,600	Every 2 months	Simultaneous	15	Both	About $2,500
Cambridge	6,350	86%	Monthly	Simultaneous	9	Mostly inside	$1 per year
Cherry Valley and Rockdale	362	326	Quarterly	Simultaneous	....	Both	.....
Chicopee	2,780	2,580	Quarterly	By districts	18	Inside	$3,000
Danvers	100	60	Quarterly and monthly.	Simultaneous	....	Both	.....
East Weymouth	2,012	1,988	Quarterly	In rotation	12	Mostly inside	$520 per year not including billing
Fall River	10,342	9,600	Monthly	.....	10	Inside	.....
Falmouth	25	13	Most quarterly, some annually	Simultaneous	....	....	.....
Fitchburg	5,200	4,800	Large ones monthly, others quarterly	Simultaneous	12	Inside	.....
Franklin	1,103	1,088	Semi-annually	Simultaneous	‡100	Inside	$150 per year
Hudson	1,276	1,225	Quarterly	Simultaneous	20	Both	About $200
Mansfield	750	725	Semi-annually	Simultaneous	....	Inside	.....
Maynard	1,073	1,000	Semi-annually	Simultaneous	10	Inside	.....
Milton	2,055	1,155	Twice in 3 months	Simultaneous	5 to 20	Mostly inside	.....
New Bedford	14,852	14,252	Monthly	Simultaneous	12	Both	.....
Newburyport	98	....	Monthly	Simultaneous	....	Inside	.....
North Attleboro	1,475	1,425	75 monthly, balance semi-annually	Simultaneous	15	Inside	$200
Northampton	135	30	Monthly	Simultaneous	1 man in 3 days	Inside	.....
North Easton	650	625	Quarterly	Simultaneous	1 man in 1 week	Inside	$25 per quarter, reading

Orange	909	894	Monthly	Simultaneous	45	Inside	$300 per year
Reading	1,688	1,634	Monthly	Two districts	....	Both	.....
Revere	3,682	2,345	Large consumers monthly, others quarterly	Simultaneous	15	Both	$2,800 per year
Somerville	10,166	9,970	Quarterly	By districts	15	Mostly inside	.....
Springfield	14,600	13,200	Quarterly	Rotation	....	Both	.....
Taunton	3,791	3,600	Monthly	Simultaneous	12 or 14	Mostly inside	.....
Walpole	930	863	Semi-annually, mills weekly	Simultaneous	3 to 30	Both	About $300
Waltham	3,372	3,270	Quarterly	Rotation	....	Generally inside	.....
Wellesley	1,588	1,400	Monthly or bi-monthly	Simultaneous	15 to 20	Inside	$22 to $24 per week
Worcester	20,715	19,460	Monthly	Simultaneous	About 14	Inside	$11,780.14
Michigan:							
Adrian	900	844	Commercial monthly, residences quarterly	Three districts	....	Inside	.....
Alpena	220	....	Quarterly	Simultaneous	....	Both	.....
Battle Creek	7,600	7,460	Small users every 2 months, large monthly.	Small ones alternately 1st of month	20	Both	$54 per year
Bay City	4,300	4,000	Large consumers monthly, others quarterly	Simultaneous	15	Both	9¾c.
Belding	830	800	Quarterly	Simultaneous	2 men 4 days	Both	$24 per quarter for reading
Benton Harbor	2,700	2,650	Residence quarterly, business bimonthly	Simultaneous	22	Both	.....
Holland	2,549	2,510	Quarterly	Simultaneous	16	Both	5c. per meter per quarter
Houghton	1,150	1,100	Quarterly	In rotation	10	Inside	$150 per month
Iron Mountain	600	575	Monthly	Simultaneous	....	Both	.....
Ishpeming	1,645	1,599	Quarterly	Simultaneous	....	Inside	$602.52
Boyne City	135	130	Quarterly	.....	10*	Both	.....
Grand Rapids	24,530	23,752	Quarterly	Rotation.	8†	Inside	$4,800 per year
Highland Park	1,120	1,000	Residence, semi-annual; business, quarterly	Simultaneous	10	Inside	.....
Jackson	9,000	8,020	Quarterly; large ones, monthly	Rotation.	....	Both	$345 per month
Lansing	11,286	10,982	Quarterly, about 250 large consumers monthly	Rotation.	30	Both	.....
Ludington	1,500	1,200	Quarterly	Simultaneous	15	Mostly outside	.....
Manistee	1,265	1,100	Quarterly	Simultaneous	7	Both	$75 per month
Manistique	17	9	Monthly	Simultaneous	....	Inside	None
Marshall	660	649	Residence, semi-annual; others monthly	.....	....	Both	$195
Mt. Clemons	1,940	....	Quarterly; business monthly	Rotation.	8 to 10	Both	$150 per month
Muskegon	4,050	....	Quarterly	Simultaneous	....	Both	.....
Niles	1,300	1,290	Quarterly; large consumers monthly	Simultaneous	....	Both	.....
Norway	104	90	Monthly	.....	....	Outside	.....
Traverse City	....	....	Quarterly	Simultaneous	16	Both	.....
Yale	15	12	Monthly	.....	....	Both	.....
Ypsilanti	1,370	1,340	Semi-annually	Simultaneous	10	Inside	.....
Minnesota:							
Chisholm	10	....	Monthly	Simultaneous	All	Both	.....
Duluth	12,144	98%	Monthly	By districts	15	95% inside	$0.3367 per meter
Ely	540	526	Monthly	Simultaneous	....	Mostly inside	About $160
Eveleth	35	30	Quarterly	Simultaneous	....	Mostly inside	.....
Minneapolis	60,930	50,000	Quarterly	Simultaneous	10	Inside	.....
New Ulm	900	800	Monthly	Simultaneous	....	Mostly inside	.....
Rochester	2,300	2,200	Quarterly; 50 monthly	Simultaneous	15	Inside	6c
St. Paul	37,380	34,961	Quarterly	Rotation.	11	Mostly inside	18.4c per year
St. Peter	305	275	Quarterly	Simultaneous	15	Inside	$20
Mississippi:							
Corinth	8	4	Monthly	Simultaneous	3	Both	.....
Greenwood	....	....	.....	Simultaneous	....	....	.....
Water Valley	750	741	Monthly	Simultaneous	38	Outside	.....
Missouri:							
Boonville	424	404	Monthly	.....	14	Both	$20
Chillicothe	1,020	995	Monthly	Simultaneous	20	75% inside	$1,108.85
Farmington	450	446	Monthly	.....	....	Both	.....
Joplin	2,000	1,800	Monthly and quarterly	Simultaneous	15	Both	.....
Poplar Bluff	100	100	Monthly	.....	15	Both	.....
St. Louis	9,046	6,181	Monthly	Rotation.	12	Both	$1,449 per month
Trenton	1,064	1,050	Quarterly	Simultaneous	20	All kinds of places	.....
University City	3,600	90%	Quarterly	Rotation.	15	Both	$200 per month
Montana:							
Billings	2,935	2,855	Monthly	Simultaneous	20 to 25	Both	7c per meter per month
Kalispell	905	858	Monthly	Simultaneous	9	90% inside	$110
Libby	None	....	.....	Simultaneous	....	....	.....
Livingston	75	56	Monthly	Simultaneous	9	Inside	.....
Nebraska:							
Aurora	700	Nearly all	Quarterly	Simultaneous	....	Both	$20 per year for reading
Columbus	1,000	975	Quarterly	Simultaneous	100 per day	Both	.....
Hastings	2,672	2,630	Quarterly	Simultaneous	25	Both	$2,194.66
Lincoln	10,853	10,651	Quarterly	Rotation.	25	Both	16c per meter per year
North Platte	1,311	1,290	Quarterly	Simultaneous	12 to 15	Both	.....
Schuyler	365	358	Quarterly	Simultaneous	15 to 20	Both	.....

METERS—Continued.

City and State—	Number in use	Number under 1 inch	Frequency of reading each meter.	Billing simultaneous or in rotation.	Average number of meters read per hour per man.	Meters in building or outside.	Cost of meter reading and clerical work on meter accounts.
New Hampshire:							
Berlin	340	327	Quarterly	Simultaneous	15	Inside	.....
Claremont	954	....	Monthly	Simultaneous	20	Inside	65c. per meter per year
Concord	2,576	....	Once every 6 weeks	Simultaneous	20	Inside	.....
Lebanon	335	332	Semi-annually	.....	....	Inside	.....
Newport	4	4	Semi-annually	.....	....	Inside	.....
Portsmouth	3,238	2,993	Large ones monthly, residences quarterly	Simultaneous	8	90% inside	$3,000 per year
New Jersey:							
Atlantic City	7,398	5,182	Quarterly, large ones monthly	Simultaneous	40	At curb	.....
Bordentown	100	84	Quarterly	Simultaneous	20	Mostly inside	.....
Bridgeton	None	....	.....	.....	....	....	.....
Camden	1,350	900	Monthly	Simultaneous	10	Most inside	$5,000 per year
Garfield	2,025	2,000	Quarterly	Simultaneous	10	Inside	$190 per mo.
Hammonton	165	150	Quarterly	Simultaneous	10	Inside	.....
Harrison	1,681	1,555	Residence semi-annual, factories monthly	Simultaneous	10	Inside	.....
Hawthorne	500	495	Not read	Simultaneous	....	Inside	.....
Irvington	3,797	3,707	Quarterly	Simultaneous	19	Both	.....
Jamesburg	98	95	Semi-annually	Simultaneous	....	Inside	.....
Milltown	365	365	Quarterly	Simultaneous	15	Inside	$32 per quarter
Newton	600	500	Quarterly	Simultaneous	....	Both	.....
Nutley	1,700	1,600	Quarterly	Simultaneous	10 to 15	Mostly inside	.....
Pleasantville	1,150	1,100	Quarterly	Simultaneous	....	Both	.....
Rahway	154	140	Quarterly	Simultaneous	8	Inside	$35 per reading
Weehawken, Camp Merritt and 45 Municipalities	42,695	40,336	Quarterly, large concerns monthly	Simultaneous	18-22	Inside	.....
New York:							
Albany	8,200	7,235	Monthly	Simultaneous	8	Both	.....
Amsterdam	500	250	Quarterly	Simultaneous	....	Inside	$2,000 per year
Beacon	1,574	1,470	Quarterly	Simultaneous	8	Both	$350 per year
Canandaigua	1,788	....	Quarterly	.....	18	Most inside	$513.72
Corning	3,026	2,921	Quarterly	Simultaneous	18	Inside	$1,911.52
Dansville	None	....	.....	.....	....	....	.....
Elmira	10,032	9,894	Quarterly	Rotation, 3 districts	15 to 20	Inside	$1,839.02 reading
Frankfort	750	740	Quarterly	Simultaneous	....	Inside	.....
Fredonia	12	4	Semi-annually	Simultaneous	....	Inside	.....
Gloversville	4,300	....	Quarterly	Rotation, 3 districts	....	Inside where possible	$40 per week
Herkimer	1,650	1,640	Residence quarterly, commercial monthly	Three districts	20	Inside	.....
Hudson	250	200	Quarterly	Simultaneous	10	Inside	.....
Little Falls	919	855	Quarterly; mills monthly	Simultaneous	....	Inside	.....
Mechanicsville	1,100	1,087	Quarterly	Rotation	....	Inside	.....
Middletown	123	100	Monthly	Simultaneous	....	Inside	.....
Mt. Morris	13	9	Semi-annually	Simultaneous	....	Both	.....
Mt. Vernon	5,818	5,679	Quarterly	Simultaneous	25	Inside	.....
North Tarrytown and 5 other villages	2,399	2,332	Quarterly	Simultaneous	....	Mostly inside	.....
Norwich	500	460	Quarterly	Simultaneous	....	Mostly inside	.....
Ogdensburg	118	75%	Monthly	Simultaneous	15	Inside	$10 to $15 per month
Olean	4,200	....	Quarterly	Simultaneous	25	Inside	.....
Owego	660	651	Quarterly; large consumers monthly	Simultaneous	22	Inside	.....
Peekskill	3,000	2,900	Quarterly	In districts	10	Inside	.....
Port Jervis	5	None	Monthly	Simultaneous	....	1 inside, 4 outside	.....
Potsdam	None	....	.....	.....	....	.....	.....
Poughkeepsie	5,500	5,000	Quarterly	Simultaneous	10	Generally inside	$1,900 per year
Rome	500	400	Quarterly	Simultaneous	....	Inside	.....
Schenectady	800	700	Semi-annually	Simultaneous	2	Inside	50c.
Sidney	None	....	.....	.....	....	.....	.....
Solvay	990	975	Semi-annually; large consumers monthly	Simultaneous	15 residential, 20 business	Inside	.....
Syracuse	26,133	27,169	Monthly	Simultaneous	20	Inside	$13,000
Tarrytown	1,005	80%	Monthly	Simultaneous	....	90% inside	.....
Tonawanda	40	18	Quarterly	Simultaneous	....	Both	.....
Troy	396	75	Monthly	Simultaneous	9	Mostly inside	Nominal
Waverly	500	470	Factories quarterly, houses semi-annually	Simultaneous	....	Inside	.....
Wellsville	750	742	Quarterly	Simultaneous	12 to 15	Inside	$391.27 per year
North Carolina:							
Concord	1,000	800	Quarterly	Simultaneous	35	Outside	$.05 per meter
Henderson	600	500	Monthly	Simultaneous	....	Outside	.....
Monroe	800	794	Monthly	Simultaneous	....	Both	.....

Statesville	932	850	Quarterly; extra large ones monthly	Simultaneous	25	90% on curb	.....
Wilmington	2,500	2,400	Quarterly	Simultaneous	30	Outside	$384 for reading
North Dakota:							
Fargo	3,100	2,995	Domestic semi-annual; commercial monthly	Rotation	15	All but 20 inside	.....
Wahpeton	16	12	Quarterly	Simultaneous	....	Inside	.....
Ohio:							
Akron	26,000	25,000	Mostly quarterly	Rotation, 3 districts	28	90% inside	$6,000 per year
Ashland	2,300	2,284	Quarterly	Simultaneous	25	Inside	$4 per day
Athens	375	350	Every 6 weeks	Simultaneous	16	Inside	.....
Barnesville	1,000	900	Monthly & quarterly	Simultaneous	20	Mostly inside	$45.50 per month
Bellefontaine	140	125	Every 2 months	Simultaneous	....	Both	.....
Bryan	700	....	Quarterly	Simultaneous	12	Both	.....
Chillicothe	1,700	1,563	Monthly	Simultaneous	30	Both	$200 per month
Cincinnati	55,000	46,000	Monthly	Simultaneous	20	Mostly inside	$103,938 per year
Cleveland	102,357	98,103	Quarterly; 1½" and over every 10 days	Simultaneous	25	Both	$73,311.42
Conneaut	1,391	1,340	Residents quarterly; factories monthly	Simultaneous	25	Mostly inside	.....
Coshocton	200	160	Quarterly	Simultaneous	5	Inside	15c. per meter
Dayton	30,438	....	Large consumers monthly; small ones quarterly	In rotation	20 to 25	Mostly inside	$14,000 per year
Delaware	1,487	1,450	Large ones monthly; domestic quarterly	Simultaneous	10	Both	.....
Dover	74	58	Semi-annually	Simultaneous	....	....	.....
East Cleveland....	4,646	4,522	Semi-annually	Rotation	....	95% inside	.....
East Liverpool....	500	450	Quarterly	Simultaneous	....	Both	.....
East Youngstown..	540	530	Small quarterly, large, daily	Simultaneous	20	Inside	$200 per month
Eaton	600	575	Monthly	Simultaneous	....	Both	.....
Findlay	3,700	3,500	Quarterly	Simultaneous	10	Outside	$2,400
Fostoria	2,800	2,790	Saloons & factories monthly	.....	25	Inside	.....
Girard	800	794	Quarterly	Simultaneous	1 man in 27 days	Inside	$100 per month
Lakewood	7,295	7,093	Quarterly	Rotation, 2 districts	15	Mostly inside	.....
Marietta	1,000	900	Quarterly	Simultaneous	15	Mostly inside	.....
Martins Ferry	130	75	Small meters quarterly, large ones monthly	.....	12	Most inside	11c per meter
Napoleon	918	900	Quarterly	Simultaneous	....	Both	.....
Newark	4,816	4,748	Quarterly	Simultaneous	20	Inside	.....
Piqua	None	....	.....	.....	....	....	.....
Ravenna	35	None	Monthly	Simultaneous	....	Outside	.....
Sidney	1,750	1,710	Quarterly	Simultaneous	25	Outside	.....
Steubenville	160	40	Quarterly	Simultaneous	10	Inside	$4.50 per day
Tiffin	2,380	2,321	Quarterly, large ones monthly	Simultaneous	....	Mostly inside	.....
Troy	1,737	1,712	Quarterly	Simultaneous	35	Both	$672
Urbana	335	305	Semi-annually	Simultaneous	10	Mostly inside	.....
Van Wert	900	875	Quarterly	Simultaneous	15	Both	.....
Wadsworth	300	292	Quarterly	.....	....	Inside	.....
Wilmington	617	607	Monthly	Simultaneous	40	One-third outside Two-thirds inside	$20 per month
Xenia	610	285	Mostly quarterly	Simultaneous	....	Inside, if possible	.....
Oklahoma:							
Durant	850	11	Monthly	Simultaneous	‡100	Outside	30c each per month
Oklahoma City....	13,000	12,000	Monthly	By districts	25 to 30	Outside	$600 per month
Oregon:							
Baker	1,640	1,606	Small ones monthly from May to Nov.; large ones monthly	Simultaneous	About 25	Mostly inside	.....
Corvallis	1,800	1,775	Monthly	Simultaneous	25	Both	75c each per year
Hood River	12	11	Monthly	Simultaneous	....	....	.....
Klamath Falls....	350	310	Monthly	Simultaneous	20	Outside	20c per meter per month
Marshfield & North Bend	90	70	Monthly	Simultaneous	6	Both	.....
Portland	17,588	16,508	Monthly	In districts	30	Outside	$2,400 monthly
Pennsylvania:							
Barnesboro	21	18	Monthly	Simultaneous	10	Both	.....
Beaver Falls.....	3,946	3,700	Quarterly	Simultaneous	....	Inside	.....
Bellefonte	106	....	Quarterly	Simultaneous	....	Both	.....
Bradford	130	60%	Quarterly	.....	....	Both	.....
Carbondale	150	24	Monthly & quarterly	Simultaneous	....	Two-thirds inside; one-third outside	.....
Catasauqua	12	6	Monthly	Simultaneous	....	Inside	.....
Chambersburg	1,369	1,294	Mfg. monthly; domestic quarterly	Simultaneous	....	Both	.....
Chester	13,685	13,305	Monthly	Rotation	16	20% outside	45.6 cts.
Clearfield	132	79	Semi-monthly	Simultaneous	10	Most inside	.....
Coraopolis	1,500	1,475	Quarterly	In rotation	....	Both	.....
East Stroudsburg..	42	36	Semi-annually	Simultaneous	10	Inside	Slight
Freeland	143	2	Monthly	Simultaneous	All in 1½ days	Inside	.....
Harrisburg	13,390	12,866	Majority semi-annually	Simultaneous	15	Inside	.....
Indiana	1,050	....	Quarterly	Simultaneous	50	Mostly inside	.....
Jersey Shore.....	28	23	Quarterly	Simultaneous	....	Inside	.....
Johnstown	6,353	6,044	Quarterly	Simultaneous	16	....	.....
Juniata	3	1	Semi-annually	Simultaneous	....	Inside	.....
Lancaster	6,521	5,741	Large ones monthly, others quarterly	Simultaneous	16	Both	10c per meter

METERS—Continued.

City and State—	Number in use	Number under 1 inch	Frequency of reading each meter.	Billing	Average number of meters read per hour per man.	Meters in building or outside.	Cost of meter reading and clerical work on meter accounts.
Lewiston, 4 other municipalities & adjacent territory	134	87	Monthly	Simultaneous	....	Mostly inside	.....
Lock Haven	3	None	Quarterly	Simultaneous	....	Outside	Nominal
Meadville	3,376	....	Quarterly	Simultaneous	31	Inside	$1,088 per year
Medea	34	21	Quarterly	Simultaneous	All in 1 day	Inside	Nominal
Minersville	38	33	Quarterly and monthly	Simultaneous	....	Inside	.....
Mount Union.....	119	108	Mostly quarterly	Simultaneous	10	Both	$10
New Kensington...	3,200	3,100	Quarterly, large ones monthly	Simultaneous	12 to 15	Inside	.....
Rankin	880	865	Monthly	Simultaneous	20	Inside	$120 per month
Sewickley	120	59	Quarterly	Simultaneous	‡70	Both	$50 per year
Shamokin	105	60	Semi-monthly	Simultaneous	....	Inside	.....
Shenandoah	170	158	Monthly	Simultaneous	20	Mostly inside	$15
Susquehanna	....	All	Quarterly	Simultaneous	10	Inside	$1 per year per meter
Tamaqua	90	75	Monthly	Semi-annually	8	Both	.....
Uniontown	3,400	3,328	Monthly	Simultaneous	20	Mostly inside	$4,500 per year
West Newton.....	275	267	Mostly quarterly	Simultaneous	30	Mostly inside	.....
Wilkinsburg	15,680	Over 99%	Domestic quarterly; industrial monthly	In rotation	25	Inside	45c each per year
South Carolina:							
Charleston	7,101	6,752	Quarterly, industrial monthly	In rotation	10	Outside	.....
Cheran	180	170	Monthly	Simultaneous	25	Outside	$200 per year
Clinton	300	285	Monthly	Simultaneous	25	Outside	.....
Rock Hill.....	788	730	Monthly	Simultaneous	18	Outside	Reading, 2½c; office work, 5c
South Dakota:							
Aberdeen	1,850	1,820	Semi-annually; commercial monthly	Simultaneous	20 to 25	Mostly inside	Reading, $3.00 per year; Clerk, $85 per month
Rapid City.....	750	725	Quarterly	Simultaneous	10	Mostly inside	.....
Tennessee:							
Clarksville	500	350	Monthly	Simultaneous	25	Outside when possible	$15 per month
Dyersburg	888	863	Monthly	Simultaneous	15	Outside	4c per meter
Fayetteville	40	36	Quarterly	Simultaneous	13	Outside	$5
Franklin	500	All	Monthly	Simultaneous	20 to 40	Both	$75 per month
Knoxville	13,908	....	Monthly	Simultaneous	60 to 75	Outside	.....
Memphis	19,734	19,204	Monthly	3 districts	30	Outside	$13,000 per year
Union City.....	100	94	Monthly	Simultaneous	....	Outside	.....
Texas:							
Cleburne	2,600	2,590	Monthly	Simultaneous	30	Outside	4c per meter
Ennis	165	150	Commercial monthly, domestic quarterly	Simultaneous	....	Outside	.....
Hillsboro	1,150	1,050	Quarterly	Simultaneous	....	Both	.....
Longview	515	12	Monthly	Simultaneous	25	Outside	$27
Port Arthur.....	2,673	2,641	Monthly	Simultaneous	25	Outside	$415 per month

*Meters far apart. †Allowing for time to and from office. §In residence district. ‡Probably per day.

(Table to Be Continued.)

(*Continued from page 407*)

"Are all meters tested periodically?" "At what intervals?" "If not periodically, what determines when they should be tested?" "Are any tested without removal from the premises?" "If so, by what method or appliance?"

Some of the answers to certain of the questions were indefinite, but we did not take the liberty to change this form to a more definite one except in the few cases when we were certain of the facts. This is especially true of the answers to the question—"What is the average number of meters read per man per hour?" The large numbers named in some replies indicate that they must refer to the number read in a day, or by a number of readers.

Answers to inquiries concerning cost of meter reading and clerical work connected with meters, and the cost of repairs and maintenance of meters, are quite evidently not all on a uniform basis. This is natural, owing to the indefiniteness of the questions. But it seemed impractibale to make the questions more definite because of the great variety of methods of keeping accounts employed in the different cities. Some of the figures are definitely stated to refer to reading the meters only. Others give the salary of the clerk who has charge of the accounts. Some are for all meters for the year; others for all meters for one billing period (month, quarter, half-year, etc.); still others the average per meter per year or per billing period. In each case the reader must decide for himslf what is probably intended, in view of the size of the figure and the frequency of reading, combined with the explanation given. In general, the cost seems to average between 3 cts and 20 cts per meter per reading.

The cost of reading meters of course varies with the number one man can read in a day, and this is governed to a greater or less extent by the accessibility of the meters. As a general rule, we would expect to find that more meters can be read when they are located outside the houses than when inside, and this seems to be borne out by the figures. From 10 to 20 meters an hour is the range of a considerable percentage of the replies; but the total range is from 3 to all sorts of impossibly high figures.

The author of the latest work on water supply says: "Water meters are usually placed in the basements of buildings, but occasionally they are set outside of a building, and protected by a suitable box." Apparently the author's experience has been limited to the northern states. Taking the country over, the meters that are set outside are more than "occasional." Of the 427 replying to this question in our questionnaire, 101 report their meters set outside, 188 set inside, and 138 set some inside and some outside.

(*Continued on page 421*)

METER MAINTENANCE.

City and State.	Cost of repairs and maintenance per meter in service.	Rep. made by waterworks	Intervals at which meters are tested	Meters not tested periodically, but	Are any tested without removal	Method of such testing
Alabama:						
Gadsden	..	All	Quarterly	.....	No	.....
Talladega	..	All cleaning, etc.	On complaint of consumer	In case of liberal users or waste and no excess reading shown	Nearly all	Closing all openings and drawing 10-gal certified cans several times
Arizona:						
Bisbee	...	...	.....	.....	...	.....
Clifton	$2.30	All	.....	When it stops running	No	.....
Arkansas:						
Fayetteville	50c. per mo.	All	.....	When in doubt as to accuracy	Few	Neptune meter tester
California:						
Alhambra	22c. per year	All	.....	If out of order or not tested for 6 months	No	.....
Anaheim	..	All	.....	.....	No	.....
Lodi	..	Worn parts replaced	.....	Complaint of customer	All	Barrel on scales
Los Angeles	30c.	All	.....	.....	No	.....
Oxnard	Negligible	...	.....	When they stop running	...	.....
Palo Alto	71c. per year	All	.....	As requested by consumers	No	Mueller met. tester
Pasadena	25c. repairs 50c. depr'c't'n	All	.....	Stopped or damaged	No	.....
Riverside	$2.30	All	.....	Suspicious readings	Yes	Portable test meter
Sacramento	..	...	.....	.....	...	.....
San Diego	90c.	All	.....	When repaired or when consumer pays for test	No	.....
Santa Maria	..	All	Annually	Consumption suggests	Yes	Test meter
South Pasadena	..	...	.....	.....	...	.....
Stockton	$1 per year	All		Reading, testing and repairing	Yes	Chiefly test meters
Whittier	..	Replacement of worn parts	Annually, 2 men working all the time	Customer's request	Nearly all	Test meter
Colorado:						
Colorado Springs	..	All	Annually; some monthly	.....	Yes	Trident test meter
Fort Morgan	..	All	Annually	.....	No	.....
Greeley	..	...	Wil be	.....	Yes	Meter tester, measure, cubic foot
Rocky Ford	..	All	.....	.....	No	Laub tester
District of Columbia:						
Washington	28c.	About 30%	.....	.....	Yes	.....
Connecticut:						
Ansonia	65c., including reading	Cleaning & new parts	3 years	.....	No	.....
Derby	..	Nearly all	5 years	.....	No	.....
East Hartford	..	None	Annually	.....	Yes	Test meter
Hartford	..	All	Once in 5 or 6 yrs.	.....	Yes	Rated test meter
Middletown	21c. per year	All	.....	Stoppage or unusual readings	No	.....
Putnam	Small	Mostly all	.....	Unusual readings	No	.....
Southington	..	Nearly all	According to water passed; also check back on readings	Time they have been in, quantity of water drawn	Not gener'lly	Portable meter Clarke meter tester in shops
South Manchester	..	All not req. spec. fitting	All tested on setting and on complaint	.....	No	.....
South Norwalk	..	Few	When removed	When doubted	No	.....
Suffield	..	All	5 years	On complaints or stoppage	No	.....
Wallingford	$1 per year	Nearly all; 1½" to 4" sent to factory	6 years	Comparison of amount used each 6 months	Yes	Special testing (b)
Willimantic	..	90%	.....	.....	No	.....
Winsted	About 10c.	New disc only	.....	When bills are higher than usual	Yes	Installing a new next to old one
Florida:						
De Land	Very small	All	Not regularly	When fault is found	Yes	Draw cubic ft. of water by weight
Fort Myers	$1.00	All	.....	When cleaned, about once a year	No	.....
Miami	36c. per year	...	.....	Consumption suggests	Yes	Neptune portable test meter
Ocala	..	All	.....	Readings	Yes	Measured cu. ft.
St. Augustine	..	All	In rotation, except in case of leakage	Cleaned and tested once a year	Yes	Portable test meter
St. Petersburg	17c. per year	All	When repaired	If stopped or show defect, or customer's complaint	No	.....
Georgia:						
Albany	2c.	All	.....	As reading indicates	Yes	.....
Americus	25c. per year	Replacing all parts & upkeep	As often as practicable	c.	No	.....
Atlanta	..	All	At least every 3 years	When they have registered capacity	No	.....
Augusta	..	All	3 years	At consumer's request	No	Mueller testing bench by weight of water
Commerce	2c. (average of 10 yrs.)	All	.....	Decrease in usual consumption	Yes	Closing openings & measure of wght.
Elberton	..	All	Annually	.....	No	.....
Fitzgerald	$20 per mo.	All	Every 2 years	.....	No	.....
Griffin	15c.	Light rep.	.....	Troubles, complaints, diminution of consumption		
La Grange	.045c.	All	When necessary	Falling off of consumption	Few	Tested meter in ser.
Marietta	Very small	Few	Annually	Complaint of customer	...	.....
Savannah	..	All	When necessary	.....	Yes	Neptune test meter
Tifton	..	All	.....	When they show decrease	Yes	Portable tester
Idaho:						
Coeur d'Alene	..	All	2 years	.....	No	.....
Lewiston	..	All	When defects are noted	When repaired or moved	Yes	Test meter
Twin Falls	..	All outside	.....	.....	...	.....
Illinois:						
Canton	..	All	.....	When sluggish or dead	...	.....
Champaign & Urbana	..	All	5 years	At request of consumer	Yes	Test meter & 1 cu. ft. can.
Chicago	$3.02, including testing	All	.....	After certain amount of water has passed	No	.....

METER MAINTENANCE—(Continued).

City and State.	Cost of repairs and maintenance per meter in service.	Rep. made by water-works	Intervals at which meters are tested	Meters not tested periodically, but	Are any tested without removal	Method of such testing
Illinois—(Continued)						
Chicago Heights	..	All	.....	Variation in consumption	Yes	Portable test meter
De Kalb	Very small	Nearly all	.....	When suspected of error, or on consumer's request	No	.....
Downers Grove	..	All	.....	Falling off from average	Yes	Portable check met.
Duquoin	10c.	Meter only	2 years	.....	Yes	By weight
Kankakee	6c. per mo.	All where possible	.....	.....	No	.....
Lincoln	..	All	At least once a yr.	.....	No	.....
Mattoon	..	All	About 2 years	.....	Large ones	Test meter
Mt. Carmel	$2	Only replace parts	Annually	When they stop	Yes	Check meter
Mt. Vernon	6c. per year	All	.....	.....	Very few	Portable test meter
Olney	30c. per year	None	.....	When consumer is not satisfied	No	.....
Paris	..	By plumbers	.....	.....	No	.....
Peru	..	...	.....	When consumption is questioned	No	.....
Princeton	..	All	.....	Consumer's complaint or trouble reported by meter reader	No	.....
Quincy	30c.	All	About 5 years	.....	No	.....
Streator	..	All	4 years	When removed	No	.....
Watseka	10c.	All	.....	When consumers are not satisfied	Yes	Hand test meter
Indiana:						
Bluffton	..	All	.....	.....	No	.....
Brazil	..	...	.....	Before installed	Yes	Measure
Columbus	$12.50 per month	All	Semi-annually	.....	Yes	Check meter
Decatur	25c. per year	All	2 years	By Public Service Commission	No	Ford meter tester
Evansville	..	All	.....	Extra high or low readings	No	.....
Goshen	32c.	All	.....	When stoppage occurs	No	.....
Greensburg	..	All	Annually	.....	No	.....
Huntington	..	...	When necessary	By length of time in service	Yes	4 cu. ft. tank
Jeffersonville	..	All except unusual cases	.....	When stopped	No	.....
Kendallville	..	All	.....	Complaint by consumer or no registration	No	.....
Knightstown	..	All	2 years	If removed	No	.....
Laporte	16c.	...	.....	Unusual readings	No	.....
Lebanon	11c.	All	.....	.....	No	.....
Linton	..	All	.....	Variation in consumption or dissatisfaction	Not often	Test meter
Madison	..	None	.....	.....	...	.....
Mishawaka	15c. per year	All except new parts	.....	Decrease in registration	No	.....
New Castle	Probably 10c	All	When readings slow	Stoppage, complaint and reduction in bill	No	Meter tester
North Manchester	..	All	.....	When accuracy is questioned	Yes	Measuring water
Plymouth	Very small	Nearly all	.....	If necessary	...	.....
Richmond	51½c.	All, if possible	5 years, large consumers oftener	.....	No	.....
Seymour	..	Very limi'd	When considered necessary	Extreme variation	No	.....
South Bend	..	All	2 years	.....	Some	1 cu. ft. measure
Terre Haute	32c. in 1918	Nearly all	About 5 years, large meters oftener	Depends upon quantity registered	Very seldom	Large meter may be tested with smaller one
Tipton	..	All	.....	.....	...	.....
Valparaiso	..	Made by plumbers	Irregular but frequent	By any apparent irregularity	No	Mueller tester
West Lafayette	..	All	.....	.....	No	.....
Iowa.					No	.....
Atlantic	..	All	.....	When accuracy is questioned	No	.....
Boone	65c.	All	At least every 5 years	.....	Yes	By test meter or measuring can
Burlington	..	All	.....	When in shop for repairs	No	.....
Cedar Falls	Slight	Nearly all	.....	Complaints by customers	No	.....
Fort Madison	..	All	.....	When out of order	No	.....
Maquoketa	25c. per year	All	2 years	Comparison of readings and conditions	No	.....
Marion	$10 per mo.	All	3 months	.....	...	.....
Marshalltown	64c.	All	Expect to once a year	By readings	Will be	Portable tester
Mason City	..	All	.....	When repaired	Yes	Regular ⅝-in. meter to test large serv.
Muscatine	15c. to 20c. for labor	All	About 6 years	.....	No	.....
Osceola	..	None	.....	When they appear out of order	No	.....
Sioux City	..	All	When sent out	By readings	Yes	Test meter
Washington	30c. per year	All	.....	.....	No	.....
Kansas.						
Atchison	$1 per year	All	Large ones annually; small every 4 years	.....	No	.....
Chanute	12c. without labor	By storekeeper	.....	On complaint of consumer or reported dead by meter reader	No	.....
Cherryvale	40c. per year	All	Semi-annually	.....	No	.....
Clay Center	..	25%	.....	Reported by reader	Yes	Test meter
Council Grove	..	Very little	Irregular intervals	.....	Yes	by weight
Emporia	10c. per year	All	.....	Stopping of meter	Yes	Recording meter
Fort Scott	..	None	.....	Whenever necessary	Yes	Portable test meter, also 7½-gal. can
Fredonia	Probably 50c. per year	All	.....	Whenever necessary	Yes	Test meter
Great Bend	..	All	Annually	.....	No	.....
Hiawatha	60c. per year	About ½	.....	When meter stops	...	.....
Holton	50c. per year	All	.....	When considered necessary	No	.....
Horton	$25 for 350 per year	All except cleaning gear trains	.....	Don't need it	No	.....
Independence	...	...	.....	.....	Yes	Test meter
Iola	(d)	All	.....	Decrease in registration	Yes	By drawing off water & weighing
Larned	$25 per mo.	Nearly all	.....	When considered necessary	Yes	Test meter
McPherson	$1 per year	All	.....	When repaired or under suspicion	Yes	Checking meter

METER MAINTENANCE—(Continued).

City and State.	Cost of repairs and maintenance per meter in service.	Rep. made by waterworks	Intervals at which meters are tested	Meters not tested periodically, but	Are any tested without removal	Method of such testing
Kansas—(Continued)						
Manhattan	..	All	.....	On consumer's request	Yes	Portable met. tester
Neodesha	50c. per year	All	About 2 years	By unusual readings	No	.....
Osage City	..	All	.....	On consumer's complaint	Yes	Test meter
Osawatomie	..	...	.....	By readings	No	.....
Ottawa	..	Nearly all	.....	Inaccurate registration	Yes	Portable cubic foot measure
Kentucky.						
Bowling Green	$1.50 per yr.	Almost all	Semi-annually	If any unusual fluctuations	Yes	Test meter
Frankfort	..	...	.....	.....	...	.....
Hopkinsville	50c. per year	All	Whenever considered necessary	Monthly reading & inspection	No	.....
Lexington	33¼c.	All exc. machine work	⅝", 10 years, or after registering 100,000 cubic feet	.....	Yes	Measuring tank or scale
Louisville	..	All	.....	Variation of readings	Yes	.....
Maysville	..	Ordinary; worn meters sent to factory	Annually	By readings	Yes	.....
Paris	..	Minor	.....	.....	No	.....
Somerset	..	All	.....	When revenue falls off	No	.....
Louisiana.						
Kentwood	..	...	.....	.....	...	.....
New Iberia	..	Ordinary	.....	When they stop	No	.....
Shreveport	$1964.57 for 3754 meters in 1918	All	When changed	By consumption	No	.....
Maine.						
Bangor	$2.04	All	When deemed necessary	.....	No	.....
Caribou	None	None	.....	.....	...	.....
Eastport	..	All, except on large meters	.....	.....	Yes	Another meter and by measure
Gardiner	..	...	Annually in June	.....	No	.....
Houlton	..	...	.....	.....	...	.....
Lisbon Falls	5c.	Putting in new parts	.....	When stopped or repaired	No	.....
Rockland	..	All	3 or 4 times a yr.	Lack of revenue	No	.....
Sanford	..	All	.....	When found stopped	No	.....
Van Buren	..	...	.....	.....	...	.....
South Paris	..	...	.....	.....	No	.....
Maryland.						
Baltimore	..	All	.....	Inaccurate registration	No	.....
Cumberland	..	All	No system of testing	.....	...	.....
Hagerstown	20c. in 1918	Ordinary	.....	Variation in consumption	Yes	Neptune test meter
Massachusetts.						
Attleboro	..	...	.....	At owner's request	...	.....
Barre	..	...	.....	.....	No	.....
Belmont	..	Clean, set up & test	During sixth year	Stopped meters taken out of service	Yes	Master meter
Cambridge	$1.25 per yr.	All	.....	At request of consumer	No	.....
Cherry Valley	..	Nearly all	.....	Variation of readings	Yes	By meter
Chicopee	35c.	All	.....	At request of consumer, or if suspicious	No	.....
Danvers	..	Nearly all	.....	As needed	Yes	Meter tester
Easthamption	$900 a year	...	.....	When running slow or stopped	No	.....
East Weymouth	41c. in 1918	All ordinar'y	.....	When decreased readings noticed	Yes	Test meter for small, pitometer for large meters
Fall River	..	All	When necessary	For stoppage, etc.	No	.....
Falmouth	..	...	.....	.....	...	.....
Fitchburg	⅝" about $45	All minor repairs	.....	When necessary	No	.....
Franklin	Very small	All	About 5 years	By amount passed through	Some	Test meter
Hudson	$1.00	About ⅓	.....	When deemed necessary	No	.....
Mansfield	Small	All possible	.....	By way they run or when stopped	No	.....
Maynard	..	Cleaning & broken pa'ts	.....	When they stop or leak	No	.....
Milton	..	All	About 8 or 10 yrs.	.....	Yes	Trident test meter ¾ inch
New Bedford	88c.	About ⅞	5 years	.....	No	.....
Newburyport	..	Partially	.....	When out of order	...	.....
North Attleboro	60c.	About ⅞	When removed for repairs	When stuck	Some	Small test meter
Northampton	..	Very little	When necessary	By length of service	No	.....
North Easton	..	...	.....	.....	Seldom	Putting on one beside it
Orange	50c.	...	.....	When below average consumption	No	.....
Reading	..	75%	.....	.....	Few	Tank holding 1 c. f.
Revere	..	All	.....	By request or when repaired	No	.....
Somerville	..	Nearly all	.....	Opportunity	No	.....
Springfield	..	All	.....	When stopped or decrease in registration	...	.....
Taunton	$1.25 per yr.	All ordinary	4 years	.....	Seldom	.....
Walpole	Not over 15c.	All	As needed	By inspection	Yes	Test meter
Waltham	..	All	.....	When they slow down or on complaints	Yes	Master meter
Wellesley	85c. per year	Minor	.....	When slow or out of order or on complaints	No	.....
Worcester	59½c.	Nearly all	.....	When slow	Few	Filling a 1-ft. tank
Michigan.						
Adrian	..	All	2 years	.....	No	Weighing water
Alpena	..	All	Annually or oftener	.....	Yes	Test meter
Battle Creek	42c. per year	Nearly all	Never longer than 7 years	.....	Few	Portable ¾-in. test meter
Bay City	13.6c.	All	3 years if possible	Whenever property is vacant	No	.....
Belding	0420 yast yr.	All	.....	When opportunity offers	No	Weighing water
Benton Harbor	..	All	.....	By complaint	Yes	Box holding 1 cu. ft. water
Boyne City	..	All	.....	When deemed necessary	No	.....
Coldwater	..	...	.....	.....	...	.....

METER MAINTENANCE—(Continued).

City and State.	Cost of repairs and maintenance per meter in service.	Rep. made by water-works	Intervals at which meters are tested	Meters not tested periodically, but	Are any tested without removal	Method of such testing
Michigan—(Continued)						
Grand Rapids	$1.16 av. for ⅝" & ¾" meters	All	.....	On request or when repaired	No	.....
Highland Park	..	Minor	.....	By extreme variation in readings	No	.....
Holland	10c.	All	Irregular	Stop meters, removed meters, or unusual variation in readings	Yes	Test meter
Houghton	Very small	All	Quarterly	.....	Yes	Mueller tester
Iron Mountain	..	Minor	2 to 3 years	Action and average bills	No	Mueller tester
Ishpeming	$1245.91	...	.....	When out of order or consumer's complaint	No	.....
Jackson	..	All	Variable	.....	No	.....
Lansing	..	All	.....	When customers complain or by meter cards	No	.....
Ludington	..	All	Irregular	When meter is removed or bill drops	No	.....
Manistee	..	All	Annually	.....	Yes	Test meter
Manistique	..	All	.....	When out of order	No	.....
Marshall	Total last yr., $75	Nearly all	.....	By checking up average bills	No	.....
Mount Clemens	5c. per year	All	Some monthly	.....	Yes	Wght. & measurem't
Muskegon	..	All	As necessary	Overhauled after reading	No	.....
Niles	..	All	As they fall down	When they fail to register	No	.....
Norway	..	All except broken pa'ts	.....	When readings show variation	No	.....
St. Joseph	..	All	When received at shop	About 90 changed per quarter on account of sand	No	.....
Traverse City	..	All	.....	On large bills and when user insists	No	.....
Yale	..	Not many	.....	.....	No	.....
Ypsilanti	..	All	.....	Consumer's request and low readings	No	.....
Minnesota.						
Chisholm	..	...	.....	By inspection	...	.....
Duluth	$.1621 in 1918	All	.....	When premises are vacated	Very few	Tank measurement
Ely	..	All	.....	.....	Yes	Wght. & measurem't
Eveleth	..	...	.....	When they stop or under-register	No	Weighing water
Minneapolis	..	All	6 years	When repaired	No	.....
New Ulm	..	...	.....	When they stop	No	.....
Rochester	50c. per year	All	Quarterly as to condition	Length and amount of service	No	Mueller machine
St. Paul	..	All	.....	By decrease in registration or long period of service	No	.....
St. Peter	25c.	All	.....	When they slow up or stop	No	.....
Mississippi.						
Corinth	..	Installation only	.....	By comparative reading	...	.....
Greenwood	..	...	.....	.....	...	.....
Water Valley	$1.50 per yr.	All	When needed	When consumer has a big leak	Yes	Measuring water
Missouri.						
Booneville	..	All	.....	.....	...	.....
Chillicothe	About $1	All	.....	Slowing up, dead meter or consumer's request	Yes	Test meter or gallon measure
Farmington	..	All	.....	Consumer's complaint	Yes	.....
Joplin	..	All	1 to 5 years	.....	Yes	Smaller meter
Poplar Bluff	..	None	.....	.....	...	.....
St. Louis	..	All	.....	.....	Yes	Test valve
Trenton	..	All	.....	.....	No	.....
University City	15c. per mo.	All	Different intervals	When bill is too high	No	.....
Montana.						
Billings	..	All except burning & freezing	.....	By amount and kind of service	Yes	Test meter
Kalispell	About 2c.	All	When deemed necessary	By registration and other conditions	No	.....
Libby	..	...	.....	.....	...	.....
Livingston	50c. per year	All	Annually	.....	No	.....
Nebraska.						
Aurora	..	All from now on	Insist on every 2 years	.....	No	.....
Columbus	..	None	.....	When broken or stopped	...	.....
Hastings	34c.	All	2 years	.....	No	.....
Lincoln	36c.	Setting repaired meters	Over 1" annually	When requested or when they stop	Yes	Standard meter
North Platte	..	All	.....	Whenever taken out for rep.	Occasionally	Test meter
Schuyler	..	All	Not regularly; every 2 years	On consumer's request or suspicious readings	Yes	Connecting
New Hampshire:						
Berlin	..	Largely	Many annually and all at least every 6 years	When consumer desires	No	.....
Claremont	38c. per year	About 75%	.....	By amount of water passed	No	.....
Concord	$0.157	All possible	5 years	.....	No	.....
Lebanon	..	All ordinary	.....	When stopped	No	.....
Nashua	28c. per year average	All	6 years	.....	No	.....
Newport	Nominal	...	.....	.....	...	.....
Portsmouth	..	75%	When excessive	When excessive	Yes	Cubic feet measure
New Jersey.						
Atlantic City	..	...	.....	When they stop or register erratically	No	.....
Bordentown	50c. per year	All	.....	When readings are low	No	.....
Bridgeton	..	...	.....	.....	...	.....
Camden	$3 per year	95%	.....	On consumer's complaint	Yes	.....
Garfield	25c.	All	.....	On complaint or when below average consumption	No	.....
Hammonton	..	All	.....	When repairs are made	No	Measurer
Harrison	..	None	3 years	.....	No	.....
Hawthorne	..	...	.....	When they leak or stop	...	.....
Irvington	..	All	2 years	.....	No	.....
Jamesburg	..	All	2 years	.....	...	.....
Milltown	$.02	All	.....	Consumer's complaint or big change in bill	Yes	(e)

METER MAINTENANCE—(Continued).

City and State	Cost of repairs and maintenance per meter in service.	Rep. made by waterworks	Intervals at which meters are tested	Meters not tested periodically, but	Are any tested without removal	Method of such testing
New Jersey (Continued)						
Newton	..	Very little	.....	.....	No	.....
Nutley	..	None	.....	When working too fast	Yes	Test meter
Pleasantville	..	(f)	As required by Utilities Comm.	Amount passing meter	Yes	Portable test meter
Rahway	$2	All except large meters	.....	When they stop	No	.....
Weehawken, Camp Merritt & 45 municipalities	46½c. in 1918	All except large meters	When meter has registered certain amount, depending on size	.....	No	.....
New York.						
Albany	..	All	5 to 10 years	According to size and amt. of water passed	No	.....
Amsterdam	$1.50 to $3	All	When necessary	When complaint is made	Yes	.....
Beacon	50c. per year	All	.....	Amount of consumpton	Yes	Test meter 100%
Canandaigua	23c.	All	.....	When repaired or falls below average.	No	.....
Corning	39c.	All except frozen meters	Semi-annually	.....	Yes	Portable test meter
Danville	..	...	.....	.....	...	.....
Elmira	12c.	All	Intermittently	By readings	No	.....
Frankfort	..	None	.....	By cnodition at time of reading	No	.....
Fredonia	..		.....	.....	No	.....
Gloversville	..	All	According to use	.....	No	.....
Herkimer	..	All	Will be tested periodically	.....	No	.....
Hudson	..	All	.....	When apparently out of order	No	.....
Little Falls	..	All	.....	By general conditions	Some large ones	Hose and meter
Mechanicsville	..	All	.....	When not registering and below average reading	No	.....
Middletown	..	...	.....	Low reading and Length of service	...	.....
Mount Morris	..	...	.....	Apparent incorrect readings	...	.....
Mount Vernon	..	Minor only	.....	Consumer's complaint or decrease of bill	Yes	Gallon measure
North Tarrytown and 5 other villages	..	All	.....	.....	Yes	Various methods
Newark	..	All	.....	.....	...	.....
Niagara Falls	..	All	.....	When out of order or stopped	Yes	Trident tester
Norwich	About $1	All except factory rep.	.....	Consumer's complaint	No	Empire Meter Co.'s stand
Ogdensburg	50c. per year	General repairs	After repairs and before setting	By their condition	No	.....
Olean	..	All	.....	When they stop or run capacity of dial	No	Weight
Owego	..	...	.....	.....	No	.....
Peekskill	..	All	When necessary	When consumption seems abnormal	Generally	Weight & measure
Port Jervis	Nominal	Nearly all	.....	.....	No	.....
Potsdam	..	...	.....	.....	...	.....
Poughkeepsie	..	All	.....	By decline in size of water bill	Yes	Test meter
Rome	..	All	.....	.....	No	Test meter
Solvay	..	All	Large meters annually		Yes	Portable test meter
Schenectady	$4.50	All	Cleaned every 6 months	.....	Yes	Test meter
Seneca Falls	..	All	.....	Running slow or stopping	...	.....
Sidney	..	...	.....	.....	...	.....
Syracuse	$0.146	All	At least every 8 years	.....	Yes	Portable standard meter
Tarrytown	..	All meters 2" & under	When installed or repaired Annually	When readings appear abnormally low	No	.....
Tonawanda	..	...	.....	.....	...	.....
Troy	$3.40	None	2 years	On request of consumers or when readings fall off	No	.....
Waverly	..	Only on RR. & some factories	.....	When they appear to be incorrect	No	.....
Wellsville	40c. per year	Kept in good order	.....	When out of order	No	.....
North Carolina.						
Concord	..	...	.....	Consumer's request or broken down	No	.....
Henderson	..	All exc. 2" meters	.....	.....	...	.....
Monroe	..	All	.....	If consumer insists	Yes	Test meter
Statesville	50c. per year	Nearly all	Annually	.....	Yes	Standard meter
Wilmington	..	All	In future annually or biennially	.....	No	.....
North Dakota.						
Fargo	..	All	.....	At customer's request and when meter is removed	No	.....
Wahpeton	Very small	All	Semi-annually	.....	Yes	.....
Ohio.						
Akron	..	All	All 1½" and over, quarterly to annually	If registration is slow	2" & over	Test tee left in line & connected by hose to test meter
Ashland	..	All	.....	In winter months	No	.....
Athens	Not much	Nearly all	.....	Whenever read	Yes	3-gal.container
Barnesville	40c.	All	.....	When they fail to register	No	.....
Bellefontaine	..	All	.....	.....	No	.....
Bryan	50c.	All	.....	When not runnng	No	.....
Chillicothe	..	All except frozen and strained	.....	When readings fall off	Yes	Portable meter
Cincinnati	..	...	.....	By unusual registration	No	.....
Cleveland	37c.	All	Large meters annually	After certain consumption	Yes	Hose and meter
Conneaut	..	...	When not registering	When bills appear low	No	.....
Coshocton	..	Slight repairs	.....	Apparent excessive use	No	.....
Dayton	About $1	All	.....	Test "dead" meters first	Yes	Measuring device
Delaware	..	Nearly all	.....	When consumption less than average	No	.....
Dover	50c.	All	.....	.....	No	.....
East Cleveland	..	All	.....	General conditions	No	.....
East Liverpool	..	...	.....	.....	No	.....

METER MAINTENANCE—(Continued).

City and State	Cost of repairs and maintenance per meter in service.	Rep. made by waterworks	Intervals at which meters are tested	Meters not tested periodically, but	Are any tested without removal	Method of such testing
Ohio—(Continued)						
East Youngstown	$2 per year	All	Annually	.....	Yes	Neptune meter tester
Eaton	..	All	.....	When repaired	No	Test meter
Findlay	25c.	All	.....	When consumption falls off	No	.....
Fostoria	..	All	2 year	When repaired in shop	No	.....
Girard	2c.	All	.....	When deemed necessary	Yes	Approved U. S. gal.
Lakewood	..	All	Irregular	After registering 180,000 cu. ft.	No	.....
Marietta	..	Very little	.....	.....	...	.....
Martins Ferry	10c. to 12c.	...	.....	At consumer's request when out of order	No	Weight of water
Napoleon	..	All	.....	When they fail to operate	No	.....
Newark	..	All	Expect to periodically	When readings show decline	No	.....
Piqua	..	...	.....	.....	...	.....
Ravenna	..	All	9 months	Comparison of readings	No	.....
Sidney	..	All	.....	When they stop or register low	No	.....
Steubenville	Very little	Small work	Expect to periodically	When meter fails to register.	No	.....
Tiffin	70c. for 1918	So far as possible	3 years	.....	Yes	Buffalo test meter
Troy	30c. per year	All	.....	When stopped or slow	Yes	Test meter
Urbana	..	All	.....	When deemed necessary or consumer's complaint	No	.....
Van Wert	75c.	All except new parts	.....	When found dead, and repair'd	No	.....
Wadsworth	..	All	Not determined	.....	...	.....
Wilmington	4c. per mo.	All	.....	On customer's request for excessive bills	Yes	Standard tested measure
Xenia	..	Small repairs	Not until they stop	When bills do not average up	No	.....
Oklahoma.						
Durant	18c. per year	All	Annually	.....	Yes	Portable test meter
Oklahoma City	..	All	.....	Whenever taken out and reset	Yes	Measuring
Oregon.						
Baker	..	All	.....	.....	...	.....
Corvallis	25c. per year	All	.....	Noticeable change in registration	No	.....
Hood River	..	...	.....	.....	...	.....
Klamath Falls	Negligible	All	.....	On complaint of customer or irregularity	No	.....
Marshfield	..	All	Annually	.....	No	.....
Portland	10.8c.	All	When repaired	When they stop registering	No	.....
Pennsylvania						
Barnesboro	..	All	Annually	Customer's complaint	No	.....
Beaver Falls	..	All	.....	.....	No	.....
Bellefontaine	..	...	.....	.....	Yes	.....
Bradford	..	All minor	Annually	.....	...	.....
Carbondale	..	Nearly all	Annually	.....	No	.....
Catasauqua	$5 a year	None	.....	When deemed necessary	No	.....
Chambersburg	..	All	10 years and when repaired	.....	No	.....
Chester	$0.488	All	4 to 10 years	.....	...	.....
Clearfield	..	Small repairs	.....	.....	No	.....
Coraopolis	..	All	.....	By irregularity in reading	No	.....
East Stroudsburg	$10 per year	None	.....	When they fail to register	Yes	Standard measure
Freeland	..	All	Monthly	.....	No	.....
Harrisburg	..	About 96%	.....	By inspector's condemnation	No	.....
Indiana	..	All	.....	At customer's request	Yes	Attaching perfect registering meter
Jersey Shore	Very small	None	.....	.....	No	.....
Johnstown	..	All	3 years	.....	...	.....
Juanita	Very small	All	Not regularly	.....	Yes	Neptune water tester
Lancaster	7c.	All	5 years	.....	No	.....
Lewiston, 4 other municipalities and adjacent territory	..	Replacing new parts	As required by People's Service Commission	When new parts are put in or meters are defective	Yes	Test meter
Loch Haven	..	...	.....	.....	Some	Test meter
Meadville	41c.	All	.....	After registering certain amt.	...	.....
Media	Nominal	...	.....	When required	No	.....
Minersville	..	All	5 years on %	.....	...	.....
Mount Union	$2 per year	All	When necessary	Customer's complaint	Yes	Portable tester
Rankin	31c. in 1918	All	No stated intervals	Variations not otherwise explainable	Yes	.....
Sewickley	$60 per year	All	.....	When out of order	No	.....
Shamokin	..	All	Annually	.....	No	.....
Shenandoah	..	Replacing parts	.....	By monthly inspection	No	.....
Susquehanna	50c. per year	...	.....	On complaint	No	.....
Tamaqua	..	Cleaned each year	.....	When cleaned and inspected	Yes	Water measured
Tyrone	..	None	.....	By comparative monthly readings	No	.....
Uniontown	..	90%	.....	When they stop, or by request	No	.....
West Newton	$1 per year	All	5 years	Consumer's request	Yes	Tank
Wilkinsburg	$.658 per yr.	All	No regular intervals	By rules of Public Serv. Com.	No	.....
South Carolina.						
Charleston	..	98%	.....	.....	No	.....
Cheraw	25c.	None	.....	Upon complaint or suspicion	Yes	Test meter
Clinton	Very small	All	.....	Customer's complaint	No	.....
Rock Hill	..	All	.....	When readings indicate necessity	Yes	Standard test meter
South Dakota.						
Aberdeen	40c. per year	All	.....	When readings indicate necessity	No	.....
Rapid City	Nominal	All	.....	.....	No	Master test meter
Tennessee.						
Clarkville	15c.	All	Quarterly, semi-annually and annually	Upon service each meter gives	Yes	Connecting perfect meter on outlet line
Dyersburg	..	All	2 years	.....	No	.....
Fayetteville	...	...	.....	When in need of repairs	No	.....
Franklin	About $1	Nearly all	.....	When reading indicates necessity	Yes	Measuring flow
Knoxville	..	All	.....	When not registering	No	.....
Memphis	45c.	99%	.....	When consumption decreases	Yes	Portable test. meter
Union City	..	...	.....	.....	...	.....

METER MAINTENANCE—(Continued).

City and State	Cost of repairs and maintenance per meter in service.	Rep. made by waterworks	Intervals at which meters are tested	Meters not tested periodically, but	Are any tested without removal	Method of such testing
Texas.						
Cleburne	3c. per mo.	All	.....	If stopped or out of order	Yes	Measure
Ennis	..	All	When they fail to register	When accuracy of meter is questioned	Yes	Measure
Hillsboro	..	All	.....	When they fail to register	No	.....
Longview	6c.	All	.....	When necessary or requested by consumers	No	.....
Port Arthur	1.7c. last year	All	.....	By variations in consumption	Yes	.....
Temple	..	All	.....	When they fail to register	Yes	Test meter
Weatherford	..	All	When necessary	When consumption is unusual	Yes	Cubic feet measure
Vermont.						
Fair Haven	50c.	All	.....	When out of order	...	.....
Montpelier	..	All	.....	.....	No	.....
Northfield	..	Nearly all	5 years	When readings show slow	Yes	1 cu. ft. tank
Richford	Nothing as yet.	...	.....	By complaint	Yes	.....
Virginia.						
Danville	..	All	.....	By monthly observation of readings	Yes	Measurement
Fredericksburg	..	None	.....	By variation in reading	Will be	Measured tank
Richmond	..	All	.....	On complaint or when repair'd	Very few	Meter tester
Pulaski	..	...	.....	.....	...	.....
Washington.						
Centralia	$1 per year	All	2 years	.....	Yes	Weighing 1 c. f. on various loads
Chehalis	17c. per mo.	Minor	No regular intervals	On consumer's complaint or drop in consumption	No	.....
Ellensburg	25c. per year	All	Annually	.....	No	Test meter
Hoquiam	20c. per year	Nearly all	3 years	.....	Yes	Portable test meter
Olympia	10c. per year	All	.....	When necessary or at consumer's request	No	.....
Port Townsend	25c. per year	All	As needed	By carefully watching consumption	No	Measuring by tank
Pullman	About 8c.	20%	.....	When consumption is above minimum 5,000 gals., if small consumer	Yes	Meter and scales
Seattle	72c. per year	All	.....	When out of order or unusual monthly consumption	No	(g)
Spokane	About 3c.	All	3 years for business meter	Whenever record indicates it necessary	No	.....
Walla Walla	..	All	Within 3-year period	.....	Some	Test meter
Wenatchee	$1.24	All	Annually	Consumer's request	No	.....
West Virginia.						
Elkins	Very small	...	Annually or oftener	When requested	No	.....
Princeton	30c. per year	All	4 years	.....	No	.....
Wisconsin						
Beloit	12c.	All	.....	.....	No	.....
Columbus	..	All	2 years	When complaint is made	Yes	Bucket method
De Pere	Very small	...	.....	.....	Yes	Measuring with a gallon measure
Eau Claire	12c. in 1918	All	.....	If dead, removed for repairs or changed	No	.....
Fond du Lac	$728.10 total per year	All	No certain intervals	High bills and stopped meters	Yes	7½ gal. measure
Grand Rapids	68c. per year	All	.....	As we can spare time	No	.....
Green Bay	..	All	.....	By consumer's request—and that is often	Yes	Weight or measure
Janesville	$20 for 1350	All	.....	By size of bill	No	.....
La Crosse	29c.	All	Consumer's request	When readings indicate falling off in consumption	Yes	(h)
Madison	52c. per year	All	Not less than 3 years	When they stop or leak	No	.....
Menominee	..	Cleaned	.....	At customer's complaint	Yes	Measurer
Milwaukee	48c.	All	Large ones, annually	Falling off of registration, defect, or consumer's request	All above 2"	.....
Portage	..	All	Semi-annually	.....	No	.....
Shawano	..	Frozen meters only	.....	When repaired or on complaint	Yes	Accurate meter
Stevens Point	20c. per year	All	9 to 12 months	.....	Yes	Measure
Watertown	10c.	All	3 years	When reading shows drop in consumption	Yes	Portable test meter
Wyoming						
Green River and Rock Springs	..	All except larger sizes	.....	When necessary or at customer's request	No	.....

(a) Also when meter reader determines that registration at any particular place is unusually low, or when stuck or out of order. (b) All large meters are set with 2 gates and a tee with ¾" plug, so that meter can be tested in place. (c) Important consumers' meters tested often and others as rapidly as possible. Interim not over 2 or 3 years. (d) Party buys meters—must keep up all repairs. (e) Put meter in tandem with tested meter and draw off water in 5-gal. measure at different speeds. (f) All repairs to distribution system up to curb line. (g) A given volume run through meter must give proper registration in cu. ft. (h) Cu. ft. measure proved and scaled by scals and weight and measure.

(*Continued from page* 414)

The great diversity in frequency of reading meters is quite interesting. Readings are reported as being made at intervals varying from one day to six months. The majority read monthly, with quarterly readings next in popularity.

Quite a number of cities make out bills by districts in rotation, thus enabling one man or set of men to keep continuously at the work of reading and making out bills. Where bills are sent quarterly, a common practice is to divide the city into three districts, which receive their bills on the three successive months of each quarter. This avoids the periodic dropping of everything else by all hands to get out the bills, the man or men who attended to this giving it almost exclusive attention and requiring no aid from the rest of the force. In spite of its apparent advantages, only a few cities have yet adopted this plan.

The regular testing of meters should, in our opinion, be more generally practised; not necessarily frequent testing, but securing assurance as to each and every meter once in every one, two, or three years that it is registering within a desired limit of accuracy. Of course, all meters are watched, and a test is made if they seem to register suspiciously.

WATERWORKS OFFICE APPLIANCES.

Addressing Machines and Adding Machines Found in Large Percentage of Offices—Other Appliances Used—Waterworks as a Business.

A waterworks office is a business office, and should be conducted as such. The receiving of the payments from the consumers is a business transaction very important to the welfare of the department or company. The correct keeping of the accounts of the consumers is a duty of the management that is most important both for insuring that the consumers pay all that they owe, and for inspiring in them a confidence in the management.

In some towns we find that the office is also used as a store room for tools, valves, meters, and other of the smaller and more valuable materials that are kept on hand; the office part, in fact, being confined to a desk that is crowded into one corner near the door. In our opinion, this is wrong. In an indistinct and unrealized way it is apt to impress the visitors to the office as typifying the superintendent's mind—as indicating that he is a mechanic by whom the business end of his job is given scant consideration. And often that estimate is about correct. But it should not be, for the correct accounting and handling of the money taken in is as important to the enterprise, whether municipal or private, as is the proper use of the money paid out for maintenance and construction.

Let the superintendent put up a partition between the office in front and the store room behind. And let him take off his overalls and put on his coat when he works on the accounts, even if alone; for this change in exteriors will help to effect a change in mental viewpoint, and to make him, for the time being, a business man in sympathy with business methods.

But the number of offices where unbusinesslike methods prevail is growing smaller rapidly. Nearly four hundred and fifty superintendents have reported to us the labor-saving appliances used in their offices, these covering all sizes of municipalities and in all parts of the country. Where such appliances are used it may safely be assumed that there is an earnest effort to employ business methods. A condensed statement of the numbers in use in these four hundred odd offices is as follows:

Addressing machines, 186.
Adding and other calculating machines, 310.
Envelope sealers, 17.
Stamp affixers, 14.
Cash registers, 8.
Bookkeeping machines, 6.
Billing machines, 6.
Letter-duplicating appliances, 6.
Automatic change makers, 6.
Coupon clipping, stub clipping, and receipt cutting machines, 8.
Numbering machines, 2.
Receipting machines, 2.
Folding machines, 2.
Dictaphones, 2.

And one each of letter opener, booking machine, check writer, and stencil cutter. Probably the majority use typewriters, although only a few mention them. Others name, as labor-saving devices, a card system of keeping accounts, instead of ledger, and the use of "window" or "outlook" envelopes. One reports his only labor-saving device as being a pencil sharpener, and "that belongs to me."

The superintendent of the Division of Water, of Dayton, O., says:

"In the labor saving office appliances, it seems well to mention our cash registers, one of which was installed last year, and the other one this year. These machines belong in every municipal water works. They enable the cashier to know at a glance how much money should be in his drawer. They show the person who pays a water bill the exact sum which was received from him, which is often more or less indefinite where discounts are given for prompt payment, or penalties added for delayed payment. They protect the water company in that the stubs which the company receives also show the payments made, and greatly facilitates the checking up or correction of mistakes which may have entered and which must absolutely be eliminated from municipal bookkeeping. Every municipal employe knows that his accounts must balance to the cent, or else a state auditor will pass certain disparaging remarks on the employes who are responsible for same.

"The public would not deal with a store that had an improper system of receiving money, where all payments do not go through the cash register, and they have the right to expect as much where their own money is being handled." (We seem to recall that a popular brand of cash register has its home in Dayton.)

The above list indicates that some offices, at least, employ all or most of the devices to be found in the most up-to-date business office. About three-fourths of the offices use adding or other calculating machines. More than forty per cent use addressing machines. (Some have the addressing done outside by offices making a business of it.) But here we come to a sudden stop. Apparently no other device is used by more than four per cent of the offices, and only two by more than two per cent.

For the smallest offices, of two or three hundred accounts made out and collected quarterly, most of the appliances named would really be unnecessary and would not pay for themselves in the labor saved. But a city of, say, 100,000, with about 16,000 accounts to keep and the same number of bills to make out and checks or cash payments to receive and acknowledge within six days each month, many of these devices should be labor savers. Even with 30,000 population the number of accounts would be about four or five thousand, and to bill this number in one week would mean almost two a minute; and a labor-saving device might easily save one employe's salary.

MAINTAINING SMALL WATERSHEDS.

In his annual report for 1918, the city engineer of Little Falls, N. Y., John E. Foote (who acts as engineer for the municipal waterworks), described the work on the water sheds of the several sources of supply. Beaver Creek, above the reservoir, was cleaned of all logs, brush and other rubbish which had accumulated along its entire length, and brush and trees along the edges of the stream were cut and burned. The work of reforesting the watershed of this creek was continued, 10,000 trees being planted. Of these, 2,000 were black locust, which will be used for posts for fencing the city's property. Also numerous sanitary surveys were made of the entire watershed.

A tract of over 8 acres on another water shed was planted to potatoes, and over 700 bushels of excellent quality were sold in the city at $1.50 a bushel. This was done largely from patriotic motives.

Cleaning up and reforesting watersheds and giving them frequent sanitary inspection are too often neglected, we fear, especially where the watersheds are small; but they are nevertheless very important maintenance features.

The WEEK'S NEWS

U. S. Road Bureau Making New Tests—Missouri's Road Law Constitutional—Iowa's New Road Law—Eliminating Health Menaces in Toledo—Filtration Plant for Sacramento—New Manager for Boulder, Colo.—City Employes' Council in English City—Airships Fighting Forest Fires—Two-Platoon System for New York City—Air Terminals in Thirty-two Cities—Municipal Markets in the United States.

ROADS AND PAVEMENTS

Government's Highway Test Experiments.

Washington, D. C.—A new series of important experiments has been started by the Bureau of Public Roads, Department of Agriculture. The work which is being done by the Division of Road Materials Test and Research is designed to investigate damage done to highways by different forms of transportation units traveling under various conditions. It is thought that the information so obtained will perhaps serve as a basis for scientific regulation of traffic on different types of pavements, incidentally indicating the types and designs of road which will best serve the needs of the traffic. It is also suggested, that from this knowledge fair consideration will be assured in legislative impositions on traffic, since an accurate measure of impact damage therefrom will be possible. The experiments will cover a wide range, taking into account four factors, those of speed, height of fall, type of tire used, and the weight of the transportation unit. Under the last heading it will be necessary for the bureau to consider distribution of weight above and under springs and on back and front axles, a quantity which is decidedly variable on different makes of motor and horse-drawn vehicles. The bureau has called upon the National Automobile Chamber of Commerce to assist in the collection of this data much of which has not been generally tabulated, and a questionnaire has been sent to all motor truck manufacturers of America on this subject. In the initial stages of the work the impact has been measured by the permanent deformation of ½x½-inch copper cylinders placed under a steel plunger subjected to the impact of traffic. A varying height of fall is arrived at by different take-offs for the machine. First experiments indicated a wide range in the force of impact as between units with solid tires and pneumatics. Working from these first steps, the bureau officials plan to perfect a machine which will take into account the factors mentioned and which will enable them to provide a constant succession of impacts on selected slabs of paving compositions. This will enable the experiments to proceed much more rapidly than would be possible under actual road conditions. Tests will be made of horse-drawn as well as motor-driven vehicles. In addition to the above experiments another series is planned to determine the wearing qualities of different types of road surfaces when subjected to very heavy traffic.

Utilities Commission Has Power Over Highway Traffic.

Salt Lake City, Utah—The powers and right of the public utilities commission of Utah in regulating stage travel over all the roads of the state have been decided in the supreme court. In a decision written by Chief Justice E. E. Corfman and concurred in by the four other justices of the court, it was decided that the Third District Court had erred in dismissing the case of the public utilities commission against Parley Jones for nonsuit. It was held that a case does exist and Justice Frick states the reason as follows: "Any road or highway which is thus being used by the public generally is, in my judgment, a public road or highway * * * over which the travel and traffic is subject to regulation by the commission." The lower court held that the defendant, in asking for a dismissal of the case against him, had established that the road over which he was asking a right to operate a stage line between Bingham and Copperfield was not a stage road and the state utilities commission had no jurisdiction over it. For this reason, it was believed, he could not be constrained from operating a stage line without the permission of the utilities commission. The case was brought into court after repeated requests to quit operations had been disregarded. The above decision establishes the jurisdiction of the public utilities commission to control stage traffic over any and all roads in Utah. There has been some question in the past regarding the rights of the commission in controlling stage travel on roads not commonly known as state roads. The road between Bingham and Copperfield was shown to be a changeable road. The defendant in supporting his case argued that the road was not fixed and stationary; that it had been changed from one side of the canyon to the other in the past ten years. Chief Justice Corfman defines a road from the compiled laws of Utah, section 2,800, as follows: "In all counties of this state, all roads, streets, alleys, lanes, courts, places, trails and bridges laid out or erected as such by the public, or dedicated or abandoned to the public, or made such in actions for the partition of real property, are public highways." The appellant contended that the canyon road in question, while admitedly located in many different places in the last ten years, has been during all this time the only thoroughfare between the two places. It is upon this point that the supreme court reversed the decision of the lower court.

Missouri Road Law Constitutional.

Jefferson City, Mo.—According to advices from Washington, the Missouri Road law authorizing county officials to issue road bonds and levy taxes therefor upon a vote of county residents, has been declared constitutional by the United States Supreme Court. The case involved disposes of proceedings concerning the validity of $3,000,000 road bonds issued by St. Louis County.

Iowa's New Road Law in Effect.

Des Moines, Ia.—The Iowa road law which inaugurates a new era in road building in the state, is now in full force and effect. There can be no hard surfacing under this new law unless the county so votes. This provision was written into the law in the form of a senate amendment before the senate could get an affirmative vote on the road bill. The state highway commission estimates that only about 1,500 miles of the 6,000 miles of primary roads are put to grade or drained. The primary roads are the roads which run from county seat to county seat across the state. Hence there is a long tedious job ahead in grading and draining these roads properly before any hard surfacing can take place. There will be no special assessments to pay for the cost of grading and draining. This cost will come out of the federal aid and motor license money, or in other words the primary fund. It is only when hard surfacing is to be undertaken as voted for by the people that assessment districts will be fixed. The amount of money for the improvement and maintenance of the roads outside the primary roads or county seat roads as they are more generally recognized will be larger under this new law than heretofore, so that such roads need not be neglected while the inter-county roads are paved. The new road law provides that all of the present road

taxes will go to these secondary and township roads and the two mill road building fund, which has heretofore been levied on farm property only, has been spread over all of the property in the county. This will therefore give the secondary roads more money than they have ever had before. The following outline of the law was prepared by senator W. G. Haskill, Eastern State District Canal, Lincoln Highway Association, Cedar Rapids:

1. Specifies an inter-county seat system of primary highways, totaling about 6,000 miles. This system to be completely hard surfaced as soon as possible.
2. Pledges the state's full co-operation to the Federal Government by the appropriation of any necessary amount to meet Federal Aid allotted to Iowa. Iowa's Federal Aid up to period ending July 1, 1921, amounts to about eight million dollars. This fund, together with an equal amount from receipts on licenses on motor vehicles, constitutes the primary road fund for the construction of the inter-county seat system of hard surfaced roads.
3. The total primary road fund is proportioned to the counties of the state in the ratio that their area bears to the total area of the state. The counties of the state may grade and drain all the primary roads within the county before laying any hard surfacing, or they may proceed at once to hard surface as rapidly as the annual allotment is available, or issue bonds for the immediate undertaking of permanent construction of their primary roads.
4. Provides that before any hard surfacing can be undertaken by the county board, the question must be submitted to the voters of the county. Provides that each county must lay out a systematic program for the development of its primary system. The cost of the improvement of the primary roads to be borne three-fourths from the primary road fund, one-fourth from assessments on specially benefited property located in the zones one and one-half miles in width on each side of the road.
5. All plans, specifications, contracts, etc., entered into by the counties for the construction of primary roads are under the full control and supervision of the state highway commission.
6. Any county may without a bond issue, without a vote of the people and for the purpose of developing the primary system, anticipate its allotment for the current and one succeeding year by the issuance of road certificates.

Should any county vote to issue bonds to anticipate its allotment from the primary road fund, the county is authorized to make such tax levy as may be necessary to meet principal and interest of the bonds.

7. No bonds shall be issued by any county with maturity postponed more than fifteen years, nor shall any bonds be sold for less than par plus all accrued interest.
8. The primary roads can be built straight through towns of less than 2,000, but no permanent surfacing is to be done out of the primary road funds in cities.
9. The state highway commission is authorized to co-operate with the board of supervisors for the purchase of road material or road machinery desired by any county, and to pay for same out of the primary road funds.
10. Establishes a secondary road system consisting of the county roads outside the primary system. This system to embrace about ten thousand miles. The secondary road system also comprises the township roads of which there are eight thousand miles within the state. All existing road funds outside the primary fund are after July 1, 1920, dedicated to the secondary roads and such funds are increased by the spreading of the two-mill road building levy, heretofore applied to farm property only, over all property within the county, including that in cities and towns.
11. Township trustees are authorized to levy an additional tax not to exceed two mills on all taxable values in the township for the development of the township roads of the secondary system. This is not compulsory.

SEWERAGE AND SANITATION

Legislature Orders City to Stop River Pollution.

Worcester, Mass.—The bill which requires the city of Worcester to remove offensive sewage from the Blackstone river and the resolve which directs the state department of health to investigate the condition of the river have been approved by Gov. Coolidge. The long-standing controversy between Worcester and the towns along the Blackstone valley will now come to a satisfactory conclusion. For years the pollution of the Blackstone river has been notorious and although from time to time individuals have made some move to relieve the situation, no benefits have ever come from their efforts and the pollution has continued as before. The original sewage disposal plant, which is now in operation, was installed under the authority of an act passed by the Legislature in 1886. Owing to the growth of the city the plant was increased in size from time to time, but the condition of the river has constantly grown worse. Last year it was officially stated by the state department of health that the condition of the river was never so bad. The new plant will be of the Imhoff type. The system has been approved by the state department of health and the department will supervise all plans and specifications before the work of installation is begun. The new system is to be installed before January 1, 1924, and the city of Worcester is required to expend not less than 200,000 a year until the plant is completed. It is estimated that the city of Worcester must expend nearly $1,500,000 in the enterprise, although there will be a substantial gain to the city in operating expenses over the present inadequate system. The law provides that the failure on the part of the city of Worcester to install the plant by the time specified, or to expend the money as required by the bill shall be prima facie evidence of negligence on the part of the city in any action for nuisance or damages brought against it. The city is ordered to remove all offensive and polluting properties from its sewage before it is turned into the river and the state department of health is required to make frequent investigations of the condition of the river and at any time to require changes or enlargements in the plant if it is deemed necessary. It is further provided that failure on the part of the city to comply with the directions and the orders of the state department of health shall be prima facie evidence of the existence of a nuisance under the provisions of the act. A most important feature of the new bill is that it requires the Attorney-General to bring action against the city of Worcester upon the request of any town situated along the river whenever it is claimed that a nuisance exists. Under the old law it was necessary for any town along the river which might be aggrieved to bring action in the courts and to defray all expenses of the prosecution. This proved so expensive in the few cases instituted that the towns were forced to quit the fight. But under the new law the state, through its highest legal department, must bring and prosecute any infringement of the law.

Eliminating Vaults and Surface Wells in Toledo.

Toledo, O.—An unusually good record, it is announced, has been made by the bureau of sanitation of the division of health, in the elimination of nuisances. Two of the worst sources of diseases, in the opinion of the division of health, are outside vaults and surface wells. While more and more of Toledo's residents are installing sewer connections and substituting city water for surface wells, there are parts of the city that are still thickly dotted with these disease spreaders. The bureau had succeeded in getting 203 outside vaults and 125 surface wells abandoned and filled up since January 1. During all of last year 92 surface wells were abolished and 204 outside vaults were replaced by modern sanitary facilities. More has been accomplished therefore in last five months than during all of 1918. This has been done entirely by moral suasion. No resort has been made to prosecutions. This result was achieved partly through the scheme of using the winter's accumulation of ashes and rubbish for filling the wells and vaults. The sanitary inspectors report that owners almost universally took this suggestion with favor and used this method of disposing of their rubbish and meeting the sanitary requirements at the same time. In 1915, when a sanitary survey of Toledo was made by Dr. Carroll Fox, a representative of the United States Public Health Service, it was estimated that there were 10,000 vaults in the city, and 4,000 to 5,000 surface wells. Arthur A. Greenbaum, chief of the bureau of sanitation, estimates that about 3,000 outside vaults have been abandoned during the last five years, but that probably a like number of new vaults have been built in the new sub-divisions that have opened during that time. He concludes, therefore, that there are still about 10,000 outside vaults within the city or its immediate environs, and about 3,000 surface wells.

WATER SUPPLY

City Penalized For Using Excess Water.

Jersey City, N. J.—Jersey City is the first municipality in the state to be penalized for failure to comply with the act of 1917, limiting the amount of water which a city may divert from a river or other stream of water. The attorney general has entered judgment in the Supreme Court to the amount of $22,285 against this municipality

for excess diversion from the Rockaway River. The law allows the drawing of 100 gallons a day for each inhabitant of a city and a penalty of $1 a million gallons, in excess of this rate. The computation on which Jersey City was penalized was based on the census of 1905, and the amount of the judgment covers the years from 1912 to the present year. Attorney general McCran's action is the result of a suit brought by the state against Jersey City in which the latter made the contention that the water supply act of 1905 did not apply to it. The court struck out this contention as no defense and allowed the filing of the judgment, which has just been carried out.

To Vote on $1,800,000 Filtration Plant.

Sacramento, Cal.—An ordinance calling for a bond election on June 26 for the purpose of creating a bond indebtedness of $1,800,000, to cover the cost of the erection of a filtration plant to obtain a clear domestic water supply for the city of Sacramento from the Sacramento river has been passed by the city commission. The bonds are to be of $1,000 denominations, running for 40 years, retired at the rate of $45,000 each year. The interest is to be 4½ per cent.

Water Company Wins Pollution Case Against City.

Niagara Falls, N. Y.—The court of appeals has advised corporation counsel Robert J. Moore and manager Huy of the Western New York Water company that the court has affirmed the injunction obtained by the private water company against the city restraining the latter from dumping effluent from the municipal filtration plant into the upper Niagara River. It was in 1915 that the Western New York company obtained the injunction from the supreme court. Appeal was taken to the appellate division, which later sustained the injunction by a divided vote, two of the five justices dissenting. Then appeal was taken to the court of appeals. The appeals acted as a stay of execution of the lower court's order and the city has since continued to dump the effluent into the river off the pumping plant. The private company contended in this case that the effluent was carried by the river currents down stream and into the intake of the private company's plant, polluting its source of water supply. To comply with the injunction order the city will now have to make connections at the filter plant with the city sewers, into which the effluent can be diverted.

STREET LIGHTING AND POWER

Power Development Plan Vetoed.

Albany, N. Y.—Governor Smith has disapproved the bill of senator Sage, regarding water power development. In doing so, the governor gives the following reasons: "The bill seeks to amend the Conservation Law, by creating a new commission to be known as the Water Power Commission, and conferring upon it certain duties of investigation as to the cost of the development, transformation, transmission and distribution of electrical energy created by the water powers of the state. As far back as 1907, an act was passed authorizing and directing the State Water Supply Commission to devise plans for the progressive development of the water power of the state for the public use, under state ownership and control. In 1911 the State Water Supply Commission was abolished by act of the legislation, and all of its duties turned over to the Conservation Commission. The Conservation Commission made a detailed study of the water power of this state, and submitted such comprehensive plans for the development thereof as required by the act of 1907. The legislation failed of enactment, but the result of that study is still with the Conservation Commission, and the duty of devising plans for the progressive development of the water powers of the state now rests with the Conservation Commission. We have had legislative committees which have collected enough data upon this subject to fill any room in the capitol. Too much money has already been expended on investigation, and this particular bill calls for an appropriation of $100,000. The report of these investigations, which is exhaustive enough to warrant the state development of its surplus waters without further delay, is on file with the State Conservation Commission. I regard any further investigation along the lines proposed by this bill as a useless waste of public funds. Action and not investigation, which at best only brings about delay, is what the people of this state are looking for. It is well known that the difficulty about the development of the water powers of this state rests in the differences of opinion as to how it should be done. Personally, I favor its development, its ownership and its control by the state itself, for the benefit of all the people. There are those who believe in its development by the state and its utilization by private interests through lease or purchase. I hold that the water powers of this state are the property of all the people, and that, when developed, the people themselves should be the beneficiaries. I can see nothing which this can do except authorize the expenditure of more money and cause the waste of more time."

Consumers Boycott Light Company to Help Strike.

Denison, Tex.—Electric lights furnished by the Texas Power and Light Company were turned out by every business house in the city and practically every residence because of a strike by electricians employed by the Texas Power and Light Company and the Dallas Light and Power Company. Union men of Denison requested that all patrons of the electric light company cut out their lights in sympathy with the striking union men and a majority of the people complied with their request. All churches of the city cut out lights. The newspapers used gasoline engines for power.

GOVERNMENT AND FINANCE

Boulder Appoints New City Manager.

Boulder, Colo.—W. D. Salter, director of public service, has been appointed city manager of Boulder, at a salary of $4,000 a year, by the city commissioners to succeed E. O. Heinrich, who resigned to go to San Francisco. The change will be effective June 15. Applications totalling 110 were received from all parts of the country for the position. It is understood that director Salter had not entered any formal application.

Franchise Tax in New York Declared Valid.

Albany, N. Y.—The appellate division of the Supreme Court, Third District, in an unanimous decision, has decided that corporations in New York State subject to the franchise tax of 3 per cent., based upon "the entire net income," are not entitled to deduct the amount of tax paid to the federal government on account of excess profits before computing the amount payable to the State. With respect to the State statute, the court said: "This is not an income tax; it is a franchise tax. It is a tax for the privilege of doing business in a corporate form in the State of New York, and the only relation of the federal act to the statute of New York is the basis for the computation of the State tax. The State franchise tax thus assessed bears equally upon every like corporation within New York. It does not constitute a double franchise tax, though the national government makes use of the same foundation in levying an income tax." The original ruling of the State Tax Commission, that no deduction of federal taxes would be allowed in computing the 3 per cent franchise tax, is therefore upheld.

City Employes Organize Consultative Council.

Bradford, England.—The Bradford city council has organized a joint consultative board to consider at regular intervals, questions of wages, hours, and working conditions, and to take necessary steps to prevent differences and misunderstandings between the corporation and its employes. The corporation is the largest employer of labor here, having nearly 7,000 employes—school-teachers,

clerks, and employes in the various public services, such as tramways and the municipal gas, electric and water plants. The consultative board will consist of 32 members, 16 appointed by the corporation, and 16 by the respective sections or groups of employes. The scheme will not in any way interfere with the liberties of the corporation on the one hand, or the rights of the unions on the other. The board will represent all sections of the employes, and the unions will, as heretofore, have full power to approach the respective committees of the corporation upon any matters they desire to bring forward. This scheme is in line with the recommendations of the well-known Whitley Committee, for the establishment of National Industrial Councils. Such councils are now in process of formation for most industries, including tramways, gas, water, and electricity, and the draft of a plan for a national council for all employes of local authorities other than the four trading undertakings named, has been formulated by a committee from the large municipal associations on the one hand and representatives of 12 large trade-unions on the other. The Bradford local supply was formed after consultation with the Minister of Labor. Already, it is stated, other municipalities are considering the formation of similar local boards.

FIRE AND POLICE

Air Ships for Fighting Forest Fires.

San Francisco, Cal.—The government has converted part of the war-time air fleet into a national forest patrol, with dirigibles, scout planes, flame extinguishing bombs and sky-riding firemen to save the billions of feet of timber annually destroyed by forest fires. The experiment is being launched in the Cleveland and Angeles national reserves in California, the U. S. Forestry service and the army working together. Successful there, it will be extended to the other 145 reservations throughout the country as fast as districts can be organized. Under this system, fire fighters will be rushed to incipient blazes it formerly took hours to reach. Bombing planes will smother small fires. Trained fire-fighters will be lowered by rope ladders from anchored dirigibles. And balloon sentries, in communication with forest posts by wireless, will hang over danger areas. The first of these sentries is on the job at Arcadia, Cal. Daily he soars to his 3,000-foot-high post. Then at ten each morning, two planes leave March Field, near Riverside, following routes from which the heavy forest can be scanned for over one hundred miles. A second patrol covers the district in the afternoon. In these planes the observers carry maps on which the forest is ruled off in squares, keyed by plainly visible landmarks and villages. A discovered blaze is immediately marked in the corresponding square on the map. The machine pilot then swoops low over the nearest village, drops a parachute message asking the finder immediately to phone the information to the district supervisor, or goes back to report personally. All residents have been informed about these messages and how to co-operate. Meantime, the dirigible at Arcadia remains aloft throughout the day, in wireless touch with ground stations where trucks suitable for hard mountain travel stand ready for instant use and a squad of ten enlisted men is prepared to rush into the forest with extinguishers, axes, picks, tanks of water and canteens.

Three Platoon System Vetoed; Two Platoons Coming.

Albany, N. Y.—Governor Smith has vetoed the Blakely bill to provide for a three-platoon system for firemen in first-class cities, after affirmative action by a referendum. "I must withhold my signature from this bill," the governor set forth in a veto memorandum, "for the reason that it creates the policy of local government with which I am not in accord. In other words, the bill provides machinery for overruling the decision of the duly elected public officials on a purely administrative matter by popular vote. The power to give relief lies with the elected officials, and, so far as the city of New York is concerned, I am informed by the city representative at Albany, that the board of estimate and apportionment is now considering and working out a two-platoon system."

New York, N. Y.—Fire commissioner Thomas J. Drennan has received from the board of estimate an appropriation for 150 additional firemen as a preliminary to establishing the two-platoon system in the department. Before July 1 the two-platoon system will be established in 100 companies, affecting about 2,500 men. It is estimated that the first cost will be about $1,500,000 a year, and that when the system has been extended by the entire department, the cost annually will be about $6,000,000. The system is to be tried first in the fire companies in congested parts of the city, where there are few hours of idleness and much heavy fire fighting. The details of the system have not been entirely worked out. Commissioner Drennan said that in the main, the two platoon system would call for day and night shifts. The tentative plan calls for fourteen hours of night duty and ten hours of day duty. The platoons will alternate weekly. "The question as to when the shifts will go on duty is still a matter of debate," said Commissioner Drennan. "We want to get a morning work hour that will be convenient to the men, and will, at the same time, make for effective work. If we make the morning hour for reporting 8 o'clock, the men will have to come from their homes just when the work-day tide is at flood, and this may mean delay. If they report at 9 o'clock they will miss the heavy traffic, and by missing it, contribute just that much to lessening the morning congestion on the transportation lines. As to how many men will be needed to make the change throughout the department, there is difference of opinion. It is possible that it will require 1,100 men to bring the department up to efficiency. Perhaps we could get along with a smaller number. For instance, we could have skeleton companies in the outlying districts. It can be done, but there is another side of the question. Let the department, working with a skeleton company, lose a frame house, entailing the deaths of a mother and child say, in Ozone Park, and it would receive more censure than if it had lost a building in Broadway. The problem is complex and must be carefully worked out." Under the present system the men work on a single shift. They have every fifth day off, and three twelve-hour leaves in each month.

MISCELLANEOUS

U. S. Plans Air Terminals in Cities.

Washington, D. C.—The Government's plan for co-operating with municipalities in the establishment of airplane landings and creating a system of aerial highways, capable of use for military, postal, and commercial purposes, has been announced by the Air Service of the United States Army. It was also made known that the Air Service, co-operating with the Post Office Department, hoped in the near future to aid in the laying out of air terminals in at least thirty-two cities and towns from the Atlantic to the Pacific, and from the Canadian border to the Gulf of Mexico. These points range in size from New York City to Flatonia, Texas, and have been selected for their fitness as places on a national system of air lanes. The new landing fields are to be of four classes, according to the importance of the city, or its position with regard to military, postal or commercial uses. No field should be proposed, the announcement states, unless it is capable of expansion, because the Air Service is looking ahead to the day when aerial navigation will challenge the older means of transportation. The announcement deals with official policy, specifications for landing fields, and classification of them. Blueprints have been prepared, showing the size and shapes of the four kinds of proposed landing fields. Local uses of the fields are to be fixed by mutual agreement.

"The development of aviation in the United States," the Air Service announcement reads, "will be along military and commercial lines. The Air Service, although concerned primarily in the military phases of aviation development, is nevertheless vitally interested in co-operation with and assisting any other legitimate agencies which are engaged in

aerial activities. Foremost among these is the Post Office Department, which now finds it necessary to establish throughout the country terminal or way stations for its aerial mail deliveries, and which is jointly associated with the Air Service in presenting this project to the attention of the municipality.

"The establishment of landing fields throughout the country through co-operation with the Government agencies and the cities concerned, will certainly operate to the advantage of both the Government and the city, because in the rapid development of commercial aviation, those cities which have provided the primary facilities for operation of aircraft in their vicinity, will have paved the way for local benefits, resulting from the development of aerial inter-city transportation, express service, mail service, emergency service and local photographic mapping of aerial protection."

The fields are to be established in accordance with articles of agreement to be entered into between the United States Government and the municipality. Neither the Air Service nor the Post Office Department will deal with any private societies or associations.

"At present," continues the announcement, "the Government can co-operate in the establishment of municipal flying fields at cities where the Post Office Department has established an aerial mail station and where the Air Service cross-country routes require intermediate stations. A study of the immediate requirements would indicate that the establishment of flying fields will be confined at present to the following cities and towns:

"Boston, New York City, Richmond, Va.; Raleigh, N. C.; Columbia, S. C.; Augusta, Ga.; Macon, Ga.; Atlanta, Ga.; Kissimmee, Fla.; Mobile, Ala.; New Orleans, Baton Rouge, La.; Beaumont, Texas; Flatonia, Texas; El Paso, Texas; Texarkana, Texas; Columbus, Ohio; Tucson, Ariz.; Phoenix, Ariz.; Yuma, Ariz.; Bakersfield, Cal.; Fresno, Cal.; Buffalo, Albany, Columbus, N. M.; Kansas City, Mo.; Oklahoma City, Okla.; Uniontown, Penn.; Daytona, Fla.; Cleveland and Chicago.

"Although the Government must confine itself at present in co-operating in the establishment of municipal landing fields at cities where the aerial mail service requires stations or where stations are required for cross-country use of the Air Service, it is not intended that such limitation should in any way restrict the establishment of other landing fields at cities and towns where local conditions would seem to warriant such action."

The general specifications provide that the locale of first-class fields should be such that transportation to and from the heart of the city would not ordinarily take longer than half an hour. They should be adjacent to a good highway and near the city car lines. They should have public service utilities, such as electric light, water supply, and sewerage, should permit of expansion and should not be in a position where they are likely to be shut in by future building operations. The minimum size of any field should be such as to allow a 600-yard runway in every direction, with no interfering obstacles. The shape should be square or rectangular. Second-class fields are those whose shape is neither square nor rectangular, and in the third class are those which are less desirable, owing to size and location and fail to meet the general specifications. Fourth-class flying fields are those which can be used only for landing in case of emergency. Should the municipalities mentioned decide to co-operate with the government, the government will furnish an expeditionary steel hangar to be erected at the expense of the municipality. The landing field will be prepared at the expense of the municipality, which will also bear the expense necessary for personnel and the maintenance of field and equipment, exclusive of airplanes.

Municipal Markets in U. S.

Washington, D. C.—According to a report about to be issued by the Bureau of the Census, Department of Commerce, municipal markets were maintained during the fiscal year 1918, by 128 of the 227 cities having more than 30,000 inhabitants. These 128 cities reported a total of 237 markets, 174 of which did a retail business, 14 a wholesale business, and 49 conducted both retail and wholesale business. The market employes numbered 540. The largest number of markets shown for any one city is 19, for New Orleans; Baltimore reported 11; New York, 9; Wilmington, Del., 8; Pittsburgh, 6; and Los Angeles, Milwaukee, Washington, D. C., and Columbus, Ohio, 5 each. No other city maintained more than 4, and the majority operated only 1 each. Since the Bureau of the Census is authorized by law to collect statistics only from those cities which have populations of more than 30,000, it was impossible to extend the inquiry to the many smaller municipalities which also maintain markets. The subject, the Department says, is a timely one, in view of the abnormally high prices now charged for most foodstuffs, and the information presented in the report will be of great value to cities which have not yet established municipal markets, but are contemplating doing so.

LEGAL NEWS

A Summary and Notes of Recent Decision—Rulings of Interest to Municipalities

Prohibition of Poles and Wires—Ordinance Becomes Contract.

(Ill.) Ordinance prohibiting erection or repair of poles and wires in streets and alleys is prima facie within the city's power.—City of Sullivan v. Best, 121 N. E. 565.

Mere fact that ordinance prohibiting erection and repair of wires and poles in streets and alleys could not be enforced against company holding franchise, so to use the streets and alleys, would not invalidate ordinance as to others.—Id.

Where a city enacts an ordinance licensing a public service company to maintain poles and wires in its streets for the necessary and reasonable conduct of its business, the ordinance, when accepted and acted upon, becomes a contract which the city cannot arbitrarily abrogate.—Id.

Expired Railway Franchise—Renewed by Ordinance—Continuous Trip.

(U. S. Sup.) For a city after the franchise of some of the lines of a street railway company have expired to pass an ordinance to continue in force for a year unless sooner repealed, with penalties for its violation, for continued operation of the company's system, with fares and transfers over the various lines, whether or not having a franchise, amounts to a grant to the company for further operation of the system, during the life of the ordinance.—Detroit United Ry. Co. v. City of Detroit, 39 S. Ct. 151.

The obligation of the franchise contract for a line of a street railway company, fixing the fare on such line at five cents without transfer, is impaired, in the case of a continuous trip beginning on a non-franchise line and extending over it and a franchise line, by an ordinance requiring all such service for five cents.—Id.

Unnecessary Obstruction by Sewer Construction.—Cost of Restoring.

(N.J.Ch.) The word "travel," in P. L. 1903, p. 164, § 7, and P. L. 1907, p. 29, § 5, providing that the construction of sewers should not unnecessarily obstruct or impede travel, includes all the methods ordinarily in common use by which people on foot or with horses, wagons, and power trucks may traverse public streets, and includes travel by means of street cars.—Public Service Ry. Co. v. Frazer, 105 A. 387.

P. L. 1903, p. 164, § 7, and P. L. 1907, p. 29, § 5, providing that sewerage commissioners in the construction of sewers should not unnecessarily obstruct or impede travel, means "reasonably necessary"; but the interruption of the use of a street railway for eight months was unreasonable, if there was a method by which such an interruption could have been avoided.—Id.

Where contractors adopted a method of constructing a sewer which unnecessarily interrupted travel for eight months on a street railway line, the actual cost of taking up the tracks, laying temporary tracks, and restoring the situation, should be paid by the contractors, under P. L. 1903, p. 164, § 7, and P. L. 1907, p. 29, § 5.—Id.

Covenants, in a contract with sewerage commissioners to construct sewers, to protect and maintain in place existing structures, held not made for the benefit of a street railway or other third persons, but for the security of the commissioners.—Id.

NEWS OF THE SOCIETIES

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

June 17-19.—TRI-STATE WATER AND LIGHT ASSOCIATION OF CAROLINAS AND GEORGIA. Ninth annual convention, Greenworth, S. C. Secretary treasurer, W. F. Stieglitz, Columbia, S. C.

June 17-20.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, St. Paul-Minneapolis. Secretary, Charles W. Hunt, 33 W. 39th St., New York, N. Y.

June 23-26. — SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, Coates House, Kansas City, Mo. Secretary, E. L. Fulkerson, 617 Washington St., Waco, Tex.

June 24-27. — AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University of Pennsylvania.

June 24-27.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

Aug. 26-28.—LEAGUE OF CITIES OF THE THIRD CLASS IN PENNSYLVANIA. Twentieth annual convention, Allentown, Pa. Secretary, Fred H. Gates, city clerk, Wilkes-Barre, Pa.

Aug. 27-29.—VIRGINIA STATE FIREMEN'S ASSOCIATION. Thirty-third annual meeting, Charlottesville, Va. Secretary, E. K. Landis.

Oct. 27-30.—AMERICAN PUBLIC HEALTH ASSOCIATION. Annual meeting, New Orleans, La. Secretary, A. W. Hedrich, 169 Massachusetts ave., Boston, Mass.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Springfield, Ill.

American Society of Mechanical Engineers.

The spring meeting of the American Society of Mechanical Engineers will be held at the Hotel Statler, Detroit, June 16 to 19. The following features will be included in the professional program:

On Monday afternoon, following a business meeting, the society's committee on aims and organization will present its preliminary report on a general meeting. This committee, consisting of over thirty members, including representatives from the various sections of the society and seven members at large, has held several meetings. The object of the committee has been to bring out the sentiment of engineers throughout the country as to what should be the controlling elements in an engineer's work under present conditions; what constitutes engineering as a profession and what are the really important functions of an engineering society in its service to engineers and the public.

The Tuesday morning session will be devoted to the subject of research under the auspices of the research committee of the society. Several papers and reports will be presented on this subject because of the impetus given to it by war conditions.

Industrial relations will be the subject of the afternoon session, including several addresses by men of national reputation. The session will be a symposium by leading engineers on the factors dominant in the labor situation, with an interchange of views on the conditions necessary for industrial peace.

Wednesday's session will be in charge of the Detroit local committee and of several of the sections of the society. It will be devoted to technical papers. There will also be a gas power session with papers on oil engines.

There will be miscellaneous technical sessions on Thursday, one of which will be for the discussion of fuels, including powdered fuel and oil fuel.

The Detroit local committee is arranging many events for the entertainment of those attending. Among those will be an afternoon and evening devoted to a boat ride on the lake during which dinner will be served.

American Association of Engineers.

The annual convention of the American Association of Engineers was held in Chicago May 12 and 13. Among the subjects discussed were: Employment problems and opportunities, proper compensation, salary schedules and society relations. Ninety delegates from thirteen of the chapters and three clubs attended, although the attendance was 186 at the biggest session.

A number of changes were made in the constitution, as follows: A national practice committee is authorized, to report on questions of ethical policy and conduct, a grade of candidate junior is added; chapters are to recommend grading of candidates; junior members may now vote but not hold office; the latest past-president is to be a director; the board is authorized to make mutual agreements with other societies. (This confirms the affiliation plan carried out with the Cleveland Engineering Society.)

Warm discussion developed over the proposal to fix the entrance fees at $5 or $10. The present by-law was retained; entrance fees, therefore, will continue to increase automatically by $2 for each 500 members above 1,000, the count to be made in December and fixed for a year. Fear that the fees would be so high as to keep out younger members gave way to the idea of the increased service that could be rendered through the larger income.

After an explanation of the similarity in work of the Engineering Institute of Canada with that of the association, by Fraser S. Keith, secretary of the former body, it was voted to leave the Canadian field to the institute and to co-operate fully with it. A telegram was received from the Oregon Engineering Society asking for a proposal either to enter as a chapter or to make joint membership possible.

A. M. Van Auken, chairman of the committee on compensation of the Chicago Chapter, presented a comprehensive report, containing schedules. (These were summarized in last week's issue.) Adoption was not asked for, but it was recommended that the national body use the data and schedules in a nation-wide study and seek to formulate a more comprehensive schedule.

A recommendation was adopted providing that abstracts of all laws applying to engineers and surveyors, which degrade and hurtfully affect the engineer, should be collected, published along with suggestions for better laws in the interest of the public and the good of the profession, and should receive the widest publicity. The St. Louis Chapter presented a schedule for the municipal engineers of that city, which was indorsed.

H. G. D. Nutting, in his paper on "Ways and Means of Obtaining Proper Compensation," indicated five ways which may be used to help the man who cannot develop sufficient initiative along selling lines. His suggestions were: Increase the demand; limit the number by license; limit the number of technical graduates (questionable); union methods (questionable); limit the fake correspondence school courses; limit the fake employment agencies with alluring offers.

F. H. Myers, speaking on the employment department, indicated that 10% of the dues is now spent on this activity. From 300 to 350 members are on the list to receive the bulletin of positions open. Circular letters to employers get 5% returns. For the week ending May 10, twenty-one men were placed in positions averaging $150 per month, at a cost of $45. Had these men gone to employment agencies the cost would have been $1,890.

The next annual convention will be held in St. Louis. The results of the letter ballot for officers are as follows: President, F. H. Newell; vice-presidents, W. W. DeBerard and F. A. Evans; new directors, W. W. K. Sparrow, P. E. Harroun, R. Burnham, F. D. Richards, A. A. Matthews and E. F. Collins.

National Highway Traffic Association.

The National Highway Traffic Association held its annual meeting in New York City, on May 14, following substantially the program already outlined in these pages. The general subjects discussed were: The organization and development of highway transport, the proper construction and control of the highways necessitated by motor express service, and the control of traffic on feeder roads.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

NEW HEAVY OIL ENGINE.

Of Hvid Type with Simplicity Feature of Design.

The new type "M. V." heavy duty oil engine manufactured by the Pittsburgh Filter & Engineering Company, embodies the well-established method known in Europe for many years as the Brons principle, and in the U. S. as the Hvid principle. This motor is designed to combine the economy of the Diesel type with mechanical simplicity. The motor is entirely independent of any carburetor, hot bulb or plate, spark plug, high pressure air compressor and storage tanks, fuel pump or spray valve. The compression is carried to approximately 500 lb. per sq. in. and the motor is started from cold, without pre-heating and put under full load in a few seconds. This motor will burn any grade of the cheaper fuels, from kerosene to the heaviest of fuel oils; the same fuel serving for starting. In the design of the type "M. V." engine, the aim has been to combine simplicity of construction with accessibility, in order to reduce the operating attention.

The "M. V." engine is of the inclosed type, and the design has adhered as far as possible to the thoroughly tested practice of modern high-speed Diesel engine. The principle of operation is as follows:

Suction Stroke: The piston moving downward, pure air is drawn into the cylinder through the inlet valve, also a small amount of fuel oil, which is under control of the governor, is drawn into a small cup within the combustion chamber. Communication between cup and combustion chamber is maintained by a series of small holes. The fuel oil is supplied to the cups by gravity from a tank a few feet above the cups. Fuel oil to this tank is delivered by a small plunger pump driven off the engine shaft and the level kept constant by means of an overflow. This overflow returns the surplus of oil to the main fuel storage tank. At the lower end of the stroke the inlet and fuel valves close.

Compression Stroke: On the return of the piston to its upper center the air is compressed to approximately 500 lbs. per square inch. The rise of temperature during the compression distills the more volatile portion of the fuel and at the upper center this vapor flashes into flame and the rise of pressure within the cup drives the fuel into the compression chamber for combustion.

Expansion Stroke: On the down stroke of the piston, after the fuel is burned, the charge expands and the pressure fall gradually to the end of the stroke.

Exhaust Stroke: During the next upward stroke of the piston the exhaust valve opens and the products of combustion leave the cylinder, completing the cycle.

In general design, the features of the "M. V." type engine are simplicity and substantial construction.

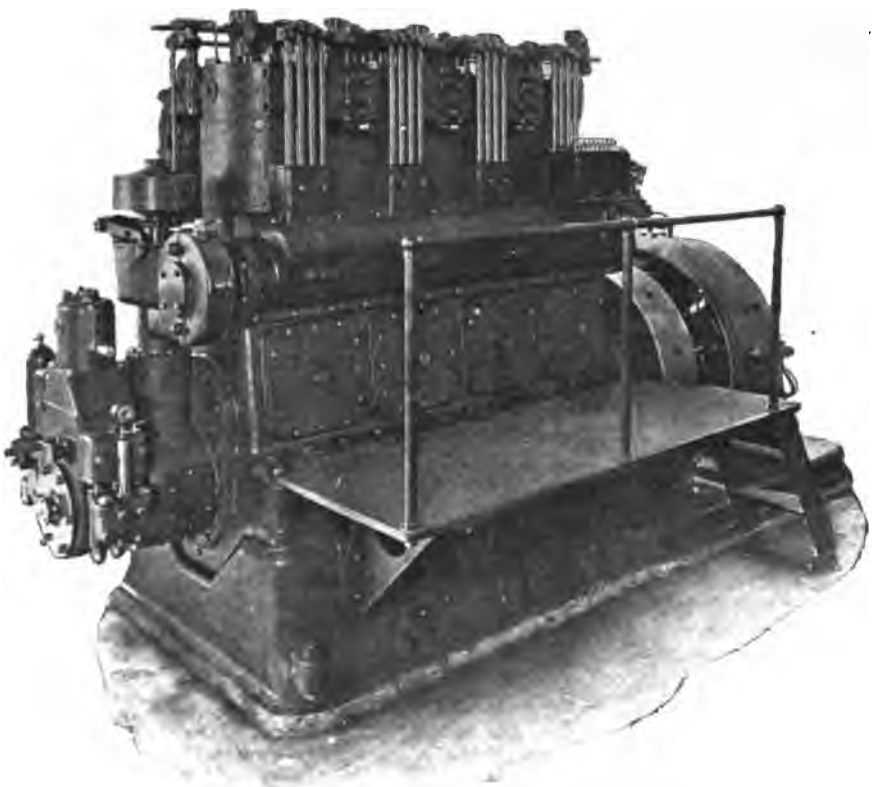
Not only is the crankcase inclosed, but the camshaft bearings, roller levers and gears run in a bath of oil. The camshaft can be removed by taking off the front cover. Accessibility of the crank pins is provided by very large openings in the crankcase. Air to the cylinders is admitted through slotted mufflers. Exhaust ells and header are water-jacketed.

Starting is accomplished by means of compressed air of about 125 lb. pressure per sq. in., each cylinder being provided with an air starting valve. The starting is assisted by compression relief valves. Starting and relief valve rockers are mounted on eccentric shafts and a single turn of the control lever brings the engine from starting into running order. This operation of the control lever also shuts off the fuel to the cylinders during the starting period. Compressed air for charging the starting tanks is supplied by a compressor driven off the engine shaft.

The amount of fuel required is regulated by a "Johns" governor mounted on a vertical shaft. Independent of this automatic regulation of a constant engine speed, a hand control lever enables to slow the engine down while running.

The lubricating system is complete and entirely automatic. The arrangement provides for the use of two grades of lubricants for the pistons and bearings respectively. The pistons are oiled by a Richardson-Phenix force-feed lubricator driven off the camshaft. This lubricator has individual feeds and a float valve for automatically keeping the lubricator filled when connected to an overhead reservoir, no attendance being required.

Main bearings, crank and piston pins are at all times flooded with a copious stream of clean, cool oil by a plunger pump driven off the engine shaft. The oil is initially forced under pressure into the main bearings, and through drilled passages of the crankshaft into the crank pins, thence through the drilled connecting-rod to the piston pin. The oil after leaving the bearings is collected in the crank pit, flows to a strainer, and from here a small plunger pump delivers it to a Richardson-Phenix filter. Leaving the filter the oil passes through a cooling coil and is used over again.



NEW HEAVY DUTY OIL ENGINE.

EXPANSION JOINTS.

To Protect Pipe Lines on Construction Work.

The C. H. & E. expansion joint for pipe lines was designed to eliminate a frequent annoyance in construction work covering long ranges—the breakage of pipe lines due to expansion and contraction caused by temperature fluctuations. In highway work, particularly, where pipe lines must very often be of considerable length, this trouble is responsible for loss of time and money.

Each joint is made to allow for twelve inches of expansion and contraction. This is done by means of a brass pipe which telescopes into a casing through a gland or stuffing box. The pipe line is connected to each end of the joint, which thus becomes a part of the line. In such work, for instance, as the construction of water-bound macadam or concrete highways, or work where it is necessary to supply water concrete mixers over long distances, these joints are calculated to prevent breakage if placed from 800 to 1,000 feet apart.

These expansion joints may also be had furnished with an air chamber (as shown in the accompanying illustration), to take up the water hammer in the line. If every second or third joint on a line is equipped with this air chamber, the water hammer will be reduced to a minimum. This will also prevent breakage of hose, etc., when the water is suddenly shut off at the mixer or at any point of the line and will produce a steadier flow.

The joint is made by the C. H. & E. Manufacturing Co., Inc.

INDUSTRIAL NEWS

The Four Wheel Drive Auto Company, Clintonville, Wis., which manufactures F. W. D. trucks, has definitely decided to build a Canadian plant at Kitchener, Ontario. This announcement was made by president W. A. Olen, of the parent company, at a banquet tendered the Four Wheel Drive directors, by two hundred business men and officials of the Canadian city. The new company is to be capitalized at $200,000, $100,000 of the stock being owned by the Wisconsin Corporation. The directors are E. C. Kahel, W. T. Barrie, W. A. Cleghorn, Archie Kerr, H. J. Sims, Henry Nyberg and J. D. Cotton. Mr. Cotton was selected by the board for president, Henry Nyberg, vice-president and sales manager, Archie Kerr, secretary and W. G. Cleghorn, treasurer. A site is to be selected and building operations commenced immediately. The building, as now contemplated, will be about 200 by 120 feet. Additions will be made as business warrants.

The Four Wheel Drive Co. furnished the British Government with many millions of dollars worth of motor trucks and is looking forward to a large commercial business in the United Kingdom, as well as in the Colonies. This plant in Kitchener is the first step in the contemplated series which is expected to take care of the increased demand for F. W. D. trucks on the international market.

American-La France Engine Fights Fire in France.

According to an item in the Pontanezen Duckboard, the official publication of the American troops in Camp Pontanezen, an American fire engine helped prevent the spread of a dangerous fire in Brest, France. The entire interior of the Municipal Theatre was completely gutted. The loss runs into many thousands of francs. The blaze started in the dressing rooms during a rehearsal. No one was injured except for slight burns or bruises suffered by the American and

EXPANSION JOINT AND AIR CHAMBER

French firemen while fighting the flames.

U. S. Army fire department number one, located at Port de Commerce, near Q. M. warehouse number four at the docks, raced up to the theatre ready for action, but the French firemen did not want their aid, so the Americans returned to their quarters. At that time the blaze was confined to the stage, but it soon broke through two doors and in a few moments the audience section and roof was burning. Flames jumped thirty feet above the roof, which fell in. Colonel Loreau, of the French Mission, then appealed to the American fire marshal, Major Charles M. Tobin, and station number one made another run. The Americans quickly laid a line of hose 2,500 feet long from the theatre across Place de Wilson and down side streets through the iron gates to a U. S. Army pipe line at Port Foye, and in less than five minutes had a powerful stream of water drenching the flames. The pumping was done by an American-LaFrance gasoline fire engine received from this country only a few weeks before. It lifted the water 70 feet above the ground surface. The French firemen pumped their water from the harbor, uphill and into a tub by power from a small steamboat. A second hose was put into the tub and a gasoline engine set on a handcart then pumped the water from the tub through a line reaching to the theatre.

Two hundred and forty gallons of chemicals were used by the army firemen in protecting buildings in the rear end of the theatre, preventing the fire from spreading further.

NEWS OF THE SOCIETIES

(*Continued from page* 428)

to the desirability of requiring franchises from motor express companies. It was stated that the principal reasons why motor express companies are failing are: Ignorance as to the cost of operation, and inability to raise prices on account of cut-throat competitors even if costs are known. It was the general opinion that legislation should be passed to limit the number of companies operating over any one route. Some, however, felt that franchises should not be given to motor transportation companies and they suggested a campaign of education as to the cost of operation.

At the evening session Arthur H. Blanchard delivered his presidential address in which he defined the subjects to be followed in the study of "Highway Transport Engineering." Addresses were presented on "The Townsend Highway Bill," by H. G. Shirley, secretary, Federal Highway Council, and "Highway Requirements," by W. G. Thompson, state highway engineer of New Jersey. A discussion on the control and construction of feeder roads was opened by E. J. Mehren, followed by George H. Price, president of the Heavy Haulage Co., of New York. A wide difference of opinion as to the feasibility and desirability of restricting heavy traffic on side roads was disclosed. It was pointed out that a very large percentage of present highways will not stand up under motor-truck traffic such as is proposed, with an allowed maximum load of 28,000 lbs. The fact was brought out that even legislative regulations at present in force are constantly broken, and it seems almost impossible to make the regulations effective.

The following officers were elected for the coming year: President, Prof. Arthur H. Blanchard; vice-presidents, David Beecroft and John T. Stanton; secretary, Elmer Thompson; treasurer, George H. Pride. The following directors were elected: Gen. T. Coleman du Pont, of Delaware; William P. Eno, of the District of Columbia; William P. Beatty, of Illinois; Charles Henry Davis, of Massachusetts; Walter R. Addicks, of New York; R. J. Corbitt, of North Carolina, and Philip A. Koehring, of Wisconsin.

The Society of Terminal Engineers.

The American Society of Terminal Engineers recently held its annual meeting in New York City. Francis Lee Stuart, chairman of the engineering committee, United States Railroad Administration, previously chief engineer of the Erie and Baltimore and Ohio R. Rs., was elected president. Other officers elected for the coming year are: Vice-presidents, John Meigs, E. H. Lee, Calvin Tomkins, Charles Whiting Baker and Maurice W. Williams; treasurer, W. Joshua Barney; secretary, J. H. Leonard.

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI NEW YORK, JUNE 14, 1919 No. 24

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Editorial Notes 431
Preserving Shade Trees—Public Control of Water.

Shade Trees in Streets 432
Decisions of the courts in the various states as to the powers of cities to remove trees and rights of citizens in the matter are discussed in a number of aspects by **John Simpson.**

Federal Aid Road Work 433
Mileage and cost of projects already approved by federal officials.

Suggestions for Concrete Pavement Construction (Illustrated) 434
Gives detail plans of strike-board, roller, belt and other appliances, and methods of conducting and inspecting work.

Red Coats for Rodmen 436

Small Municipal Blacksmith Shop 436

Disinfection of Water Supplies (Illustrated) 437
Data from nearly a hundred cities that use chlorine; effect of its use on typhoid death rates over a period of ten years.

Municipal Index 440

Contract News 19

PRESERVING SHADE TREES.

A few weeks ago we commented upon the loss to the community that sometimes has resulted from a too rigid adherence to standard street plans, whereby grown shade trees were cut down which could have been saved by a modification of the plan that would not have interfered with the convenient and proper use of the street. In this issue we give a summary of the legal discussions bearing upon the mutual rights and powers of cities and citizens with respect to shade trees.

These decisions show in general, that a citizen may obtain an injunction to prevent the destruction of shade trees in public streets by municipal authorities, and requiring the officials to show that such destruction is for the public good; but that the courts are inclined to require pretty positive proof that the judgment of the officials is at fault before deciding against them.

When we consider that the appearance of a street or of an entire city can be ruined for a generation by the arbitrary acts of a city official covering only a few days or weeks, and that much harm can be done even before an injunction can be obtained against an unanticipated tree-slaughtering campaign, it seems as though city charters should contain some protection for trees, such as requiring a public hearing before an official can destroy any tree within city limits.

PUBLIC CONTROL OF WATER.

Water companies and departments have appealed to consumers from time to time to restrict consumption in order to avert a water famine in the city, and meters are used largely to prevent waste; but we believe it is something new to impose a penalty for excessive consumption. As told last week, Jersey City, N. J., has been fined by the state $22,285 for using from the Rockaway river more than the 100 gallons per day per capita which had been allotted to it.

The right of state or federal government to guard the quality of river waters has been recognized and become familiar, and western states have long controlled the amount that could be withdrawn for irrigation; but limiting the amount that cities can use for their public supplies is a novelty. There is every reason, however, why power to limit the amount that can be used should rest in a central authority and be exercised on occasion. No one city has a right to monopolize a water supply because it "saw it first." The water flowing in the rivers of a country comprises the run-off from every square foot of land in that country; and as the entire area yielded it, the entire area has a right in it. Moreover, to permit one or

a few cities to monopolize all the water available in a state would be fatal to the growth in population and industrial development of the state outside of such cities.

The New Jersey plan seems to be a rational one and one that all states must adopt in some form, sooner or later; and the sooner, the less will be the confusion and individual hardship and the greater the benefit resulting therefrom.

SHADE TREES IN STREETS

By JOHN SIMPSON.

City Authorities Possess Broad Powers for Removal of Trees, If in Their Judgment Such Removal Is of Public Benefit—Conditions Under Which Citizens Can Obtain Injunction—Court Decisions.

Where the fee in the street is vested in the city authorities, an individual acquires no such personal right in the preservation of shade trees standing thereon as would enable him to interfere, by injunction, with the city authorities in the exercise of a discretionary power of removing such trees as obstructions upon the public streets. He has the right to the maintenance of the street as a public highway, unobstructed, but he has no legal right to the continuance in the street of a shade tree after the city authorities have concluded to remove it as an obstruction. In such cases the control of the streets by the city authorities is absolute.—City of Atlanta v. Holliday (1895) 96 Ga. 546. Castleberry v. City of Atlanta (1884) 74 Ga. 164.

And it has been held that if the municipality owns the fee in the street, no recovery of compensation can be had by an abutting owner for the removal of shade trees in front of his premises. Gaylord v. King (1886) 142 Mass. 495. But, in Lovejoy v. Campbell (1902) 16 S. Dak. 231, 236, the court said that it saw no reason why substantially the rule that, where the fee to the highway is in the abutting owner, he is entitled to damages if the trees thereon are cut or injured otherwise than is necessary for making or repairing the highway, should not prevail even when the fee is in the city or town, where the abutting owner at his own expense, and with the express or implied consent of the municipal authorities, plants and cares for shade trees along the streets adjoining his property; but that where they were planted and are cared for by the municipal authorities, the abutting owner should not be entitled to recover for injuries to them under any circumstances.

The case is different, however, where the fee to that portion of the street and sidewalks occupied by the trees is vested in the abutting owners. Such trees are the private property of the lot owners, held, however, subject to the exercise by the city, by appropriate proceedings, of its right to extend its dominant easement over the ground occupied by them, whenever, in the judgment of the city authorities, it becomes necessary for the public necessity or convenience that this be done. But to justify such an act, there must be a public necessity. Private property may not be taken for public uses upon mere considerations of public conveniences. The public convenience which will justify such a proceeding must amount to a public necessity. Whether a case of public necessity arises is a matter primarily for determination by the city authorities. If they exercise a wise descretion in the matter, the courts are without power to control them. Atlanta v. Holliday (1895), 96 Ga. 546, 555.

So the courts will not interfere where the facts show that the trees were in the center of the sidewalk and a serious obstruction to travel. Vanderhurst v. Tholcke, (1896) 113 Cal. 147; Tate v. Greensboro (1894) 114 N. Car. 392. Chase v. Oshkosh (1892) 81 Wis. 313. Or that their removal is necessary in the construction of a public improvement. Mt. Carmel v. Shaw (1895) 155 Ill. 37: Hildrup v. Windfall City (1902) 29 Ind. App. 594; Gallahen v. Jefferson (1904) 125 Iowa 324; Wilson v. Simmons (1896) 89 Me. 242.

In Chase v. Oshkosh, the court said that there could be no doubt but that the city would have been liable in damages to any person traveling along the sidewalk in the night-time who, without fault on his part, had been injured by running against these trees situated within the limits of the walk. It appeared they stood from eight to fifteen inches within the curb.

But a city may not capriciously remove such trees when it palpably appears that no such necessity exists, and that the public convenience will not thereby be subserved; and to prevent the perpetration of such a wrong, an injunction will lie at the instance of the lot owners. Atlanta v. Holliday (1895) 96 Ga. 546; Remington v. Walthall (1910) 82 Kan. 234, 108 Pac. 112; Easton v. Turner (1912) 117 Md. 111, 83 Atl. 42; Webb v. Strobach (1910) 143 Mo. App. 459, 127 S. W. 680; Paola v. Wentz (108) 79 Kan. 148; Kemp v. Des Moines (1904) 125 Iowa 644.

So, injunction was granted to restrain the removal of trees which were so situated as not to amount in any sense to an obstruction of the public highway. They were situated in a narrow vacant space between the outer curbing of the driveway of the street and the outer curbing of the sidewalk. Moreover, along this street there has been placed a great many telephone, telegraph and trolley-poles; and the proposition was to remove these trees upon the ground of public necessity as obstructions to travel, and to permit the poles mentioned to remain. In other words, a shade tree was regarded as an obstruction, when a bare pole, not quite so large in circumference as the shade trees, but very much less ornamental, was not regarded as an obstruction to travel. Doubtless this paradox found lodgment in the judicial mind; and when the circuit judge came to inquire as to what motive influenced the public authorities to their action in the premises, he concluded that there was no public necessity for the removal of these trees; that the measure was purely arbitrary, hurtful to the citizen, and with no corresponding advantage to the public. And this view the Georgia Supreme Court held justified by the evidence, and affirmed judgment granting injunction. Atlanta v. Holliday (1895) 96 Ga. 546.

It should be noted, however, that in a more recent case, Town of La Grange v. Overstreet, (1910) 141 Ky. 43, where the court approved an ordinance directing the removal of a locust tree from a sidewalk, taking judicial notice of the fact that locust trees do not make desirable or attractive shade trees, the court said, in answer to the argument as to letting poles remain in streets while trees were removed: "The conditions in many towns and cities make it necessary, or at least advisable, that these poles should be removed from the streets, while in other places their location on the streets is not a matter of much consequence. But the mere fact that the board of trustees permit these poles in the

town of LaGrange to remain in the street is not a good reason why they should be denied the right to remove this tree from the sidewalk. And here again the question of descretion lodged in municipal boards comes into notice."

It seems clear that shade trees in streets are not a nuisance *per se*, and that municipal authorities cannot remove them by merely declaring them to be a nuisance as obstructing public travel when in fact they do not in any way interfere with the public use of the highway. Burget v. Greenfield (1903) 120 Iowa 432; Everett v. Council Bluffs (1877) 46 Iowa 66; Frostburg v. Vineland (1904) 38 Md. 239; Sprowl v. Stockton (1905) 73 N. J. L. 158; Allegheny v. Zimmerman (1880) 95 Va. St. 287.

As to whether the abutting owner should have notice that public necessity calls for the removal of the trees, and be given an opportunity to transplant or remove them, the authorities are not harmonious. In Stretch v. Cassopolis (1900), 125 Mich., 167; Clark v. Dasso (1876), 34 Mich., 86, and Sproul v. Stockton (1905), 73 N. J. L., 158, it is held notice must be given. To the contrary are Rosenthal v. Goldsboro (1908), 149 N. C., 128, and Chase v. Oshkosh (1892), 81 Wis., 313; but it is to be noted that in the latter case the abutting owner had been actually previously notified to remove the trees.

In Robinson v. City of Spokane (1912), 66 Wash., 527; 120 Pac., 101, the court states what it considers to be the correct rule as follows: When, in undertaking a public improvement or for the purpose of abating a nuisance, it becomes necessary to remove shade trees from a city's streets or sidewalks, the municipal authorities are vested with the power to direct the removal of such trees, notwithstanding the objection of an abutting owner whose interests may suffer thereby. The following cases support this rule: Mt. Carmel v. Shaw (1895), 155 Ill., 37; Hildrup v. Windfall City (1902), 29 Ind. App. 594, 64 N. E., 942; Gallagher v. Jefferson (1904), 125 Iowa, 324, 101 N. W., 124; Kemp v. Des Moines (1904), 125 Iowa, 644, 101 N. W., 474; Landry v. Lake Charles (1910), 125 La., 210, 51 So., 120; Colston v. St. Joseph (1906), 106 Mo. App., 714, 80 S. W., 590; Morris v. Salt Lake City, 35 Utah, 474, 101 Pac., 373. When it appears that the city's action is not wanton or unreasonable, and that the trees stand in the way of the completed improvement, or interfere with the use of the street, the abutting owner cannot prevent their removal. Easton v. Turner (1912, 117 Md., 111, 83 Atl., 42; Jeffries v. Greenville (1911), 154 N. C., 490, 70 S. E., 919; Gianque v. Salt Lake City, Utah (1912), 129 Pac., 429. In St. Mary of the Angels Church v. Barrows (1910), 68 Misc. (N. Y.), 545, 124 N .Y. Supp., 571, the court said: "The law is well settled in the state of New York that the rights of the city in making authorized public improvements in the street with proper care and skill are paramount to the interest of an abutting owner in trees planted in the street, even though such abutter owns the fee of the street. This is true, although the trees may be injured, and although such injury might be avoided by the adoption of a different plan. The court cannot interfere with the discretionary powers of municipal authorities, and direct them to save shade trees by paving the street to a width of 20 feet rather than 30 feet, or by laying water pipes in the centre of the street rather than in the subway, or by dictating that they shall injure the pavement rather than the shade trees. If detriment to the trees of the abutter results from the adoption of such a plan of improvement in the street by proper corporate action, the case is one of *damnum absque injuria.*"

How far courts can or ought to interfere with a municipality which, in grading or paving a street, is about to destroy or seriously injure shade trees on the sidewalk of an abutting owner, is a question of some delicacy, and not always easily determined so as to avoid doing injury either to the public or to such owner. Easton v. Turner (1912) 117 Md. 111, 83 Atl. 42. In Jeffries v. Greenville, supra, for example, the court said: "We would hesitate to interfere with the exercise of the sound judgment of those who have the matter in their charge, except in an extreme case indicating bad faith, malice, or wantonness, for they are trustees of the public and as such vested with a very large discretion, as we have shown; but they should discharge their duty to the public with as little injury to the citizen as is possible under the circumstances." In Rosenthal v. Goldsboro (1908) 149 N. Car. 128, it was held to be within the power of municipal authorities to remove shade trees from the streets of a city where their roots have penetrated into sewers and obstructed the city sewerage ; and so long as the authorities act in good faith, and neither wantonly nor maliciously, the courts will not interfere with the exercise of their discretion in the matter. Whatever damage results to the abutting owner in such a case is *damnum absque injuria*, and furnishes no ground for pecuniary compensation or injunctive relief.

Ordinances are frequently passed giving municipal authorities power to remove shade trees from streets. In construing these the courts will look not only to the discretion vested in those intrusted with the carrying out of the ordinance provisions, but also to the reasonableness or otherwise of the ordinance. Where such an ordinance results in the arbitrary and unnecessary destruction of shade trees, the court will declare it unreasonable and will restrain any action thereunder. Webb v. Strobach, (1910) 143 Mo. App. 439.

In the case of LaGrange v. Overstreet, (1910) 141 Ky. 43, to which reference has already been made, the court, approving an ordinance directing the removal of a locust tree principally on the ground that it was not a desirable shade tree, said: "Shade trees add a great deal to the beauty and comfort of towns and cities. The inhabitants are encouraged to set them out, care for and protect them, and in nearly every town ordinances have been enacted looking to their safety. And so we doubt if the board of trustees in any town in the state would be so indifferent to or reckless of the wishes and civic spirit of the community as to order the removal of suitable and attractive shade trees from the streets or sidewalks, if they were so located as to leave room for convenient travel, unless there was other good reason for taking such action."

In Pennsylvania it has been held, Gitt v. Hanover, (1895) 4 Pa. Dist. Ct. 606, that a municipal ordinance authorizing the removal of a certain tree in a city street is special legislation and therefore void.

FEDERAL AID ROAD WORK

Roads estimated to cost $15,120,771 and having a combined mileage of 750.87 were approved for Federal aid during May, the amount of such aid to be $6,382,081.28. These are covered by 124 projects, the largest number approved by the Department of Agriculture since the passage of the Federal Aid Road Act.

During the month there were executed by the secretary and the several state highway departments, 81 project agreements, involving the improvement of 667.71 miles of road at a total estimated cost of $7,992,867.25, and on

which $3,570,087.22 Federal aid was requested and set aside in the Treasury. In addition, agreements to cover 59 other projects were placed in process of execution during the month.

Up to and including May 31, 1919, project statements or 1,188 projects had been approved. The 1,188 projects involve 11,350.10 miles of road, a total estimated cost of $108,295,329.15, and a total of $43,076,176.63 Federal aid. On the same date 617 project agreements had been executed, involving 5,291.86 miles of road, at a total estimated cost of $47,426,749.49, of which $19,521,259.27 was from Federal funds.

In connection with the project to create a federal highway commission to have supervision of the country's highways, secretary Houston has expressed himself as opposed to it, saying: "I am convinced that nothing material would be gained. Much would be lost. . . . The creation of a commission would entail unnecessary additional administrative expenditures, and the commission could not do anything that cannot now be done more effectively by the existing co-operative machinery. . . . I believe that many of those who are backing the proposed change do not know the facts and are not aware of existing conditions and possibilities. I believe also that their proposal stands very little chance of being enacted into law."

SUGGESTIONS FOR CONCRETE PAVEMENT CONSTRUCTION

Detail Plans of Strike Boards, Joint Boards, Roller, Belt, Floats and Other Appliances Used—Various Procedures of Construction—Features That Should Receive Special Attention of Inspectors.

As a result of his experience on concrete road construction in the southwest, Clyde E. Learned, highway engineer of the Bureau of Public Roads, has prepared for the bureau certain suggestions for inspection and construction of such roads that contain a number of features not found in ordinary practice. The more important of these are given herewith.

MATERIALS.

As all cement usually is tested before shipment, the field engineer should receive copies of these tests, together with car number and amount shipped. This information should be filed for ready reference, and as the cement cars arrive, the engineer or inspector should break the car seals and remove the shipping cards, which should be checked with the original shipping notification.

It is essential to insure that the sand used is of as good a quality as the sample by which the source of supply was selected. This requires field tests, which should include,

1. Visual inspection, this being to a great extent dependent upon the training and experience of the individual who makes the inspection.

2. Grade by means of a set of portable sieves.

3. Test for cleanness, made by the volumetric method. Shake a small sample of the sand to be tested in an excess of water in a bottle or measuring glass, allowing any suspended matter to settle on top of the sand. This test will reveal the presence of clay or loam, but does not indicate the proportion in which these materials are present in the sand.

4. Test for organic impurities. Place 4½ ounces of a sand which is to be tested in a 12-ounce graduated bottle and add enough of the 3 per cent solution of caustic soda to fill the bottle to the 7-ounce mark. Shake well and then let stand over night. If the color of the solution becomes dark red to black, the sand contains so much organic material that it should be accepted only after very careful mortar strength tests.

If gravel is used, watch it for coated material and clay lumps. Test the water used for alkalinity or acidity by means of litmus paper. The apparatus for field tests includes a set of portable sand sieves, one of portable stone screens from 2½-inch to ¼-inch, a 250 c.c. graduated glass beaker, six 12 oz. bottles, wide mouth, a set of balances, a quart of 3 per cent solution of caustic soda, a 32 oz. bottle, wide mouth, and an engineer's scale.

CONSTRUCTION.

If the contractor uses sand or other material to fill up slight depressions in the subgrade, be sure that all such material is well tamped. The total width of the pavement should be uniformly compacted; there should never be a pervious mat of sand or similar material on one side of the road and impervious material such as clay on the other, for this will cause unequal settlement and possibly longitudinal cracks.

See that subgrade is rolled properly and no traffic allowed on it after rolling; then it will be unnecessary to keep grading men at work just ahead of the concreting. Before placing concrete on the subgrade it should be well wet down, this generally requiring from ½ gallon per square yard for clay to 1½ gallons for sand.

See that the concrete is in the mixer drum for at least a minute. Prevent use of excess of water—30 to 35 gallons per cubic yard of 1:2:4 concrete is sufficient. If the concrete is not mixed enough or too much water is used in it, it will not appear uniform as it comes from the mixer. If a chute is used for distributing the concrete, a fairly steep slope is necessary, otherwise more water must be used in the concrete than is desirable for securing sound concrete. If a boom and bottom-dump bucket are used, see that the latter does not leak so as to allow mortar to escape.

Have the strike-board, joint-installing board, roller and finishing belt kept clean.

Break in the strike-board men to use care in screeding at the joints, to be sure that all excess concrete is removed, and that no low places are left at the joints. A smooth-riding surface depends more upon the striking off than upon any other operation.

Work the concrete mixer uphill when feasible, as smoother joints are thereby obtained. Use a notched straightedge straddling the joints to determine if there are any high or low points on either side.

When a sidewalk edging tool is used at the expansion joint, be sure that the concrete has first taken a slight set and that a good, clean, rounded edge is secured.

Expansion Joints.—Have the strips of jointing material kept flat before use; if scattered around, they get kinks in them which it is difficult to remove and which may appear later in the concrete. Use care in setting these strips, for crooked joints in a pavement are very unsightly.

Joint strips can be installed with very satisfactory results in the following way: A joint board is made of a 2-inch surfaced plank about 2 inches wider than the thickness of the pavement and 1 inch shorter than its width and provided with handles at both ends. (See Fig. 1.) This board is held in place on the subgrade by two or three iron pins driven behind it, and the joint strips are placed flat against the board. A few shovelfuls of concrete are placed against the strips to hold them in place until the pavement has reached that point. As soon as enough concrete has been dumped in front of

the joint board to fill the block, work is started on a new block by dumping concrete on the other side of the joint board.

When ready to use the strike board on the new block, remove the iron pins and withdraw the joint board slowly, leaving the asphalt strip in place. In withdrawing the board, the top of it is tipped away from the strip, to prevent the two from adhering together, and the board is then worked slowly up and down, thus "pumping" concrete against the strip. The joint board is then lifted slowly at one end until it is entirely out of the concrete, concrete being pushed meantime into the opening left by the board. The strike board is then placed against the projecting part of the strip on the mixer side, a few shovelfuls of concrete are placed in front of it to make up for the removal of the joint board, and striking is begun.

A metal strip can be used in place of a joint board, and offers the advantage of leaving a smaller space when withdrawn; but this is more than offset by its liability to be bent by rough handling.

Before the pavement is thrown open for use, the joint filler should be cut to a uniform height by means of a square-pointed shovel shod with two steel runners riveted to the under side of the blade, which is notched and provided with a sharp cutting edge. Enough of the strip should be left protruding to fill the depression caused by the use of the edging tool, and should be ironed out by use of a heavy asphalt smoothing iron, heated.

A split float should be used on all joints, without any exception and in spite of any protest by the finisher. It is well to round off the edges of the pavement with a sidewalk edging tool. Metal floats produce too smooth a surface and their use should be absolutely forbidden.

The finished surface should be tested with a 10-foot straight edge laid parallel to the center line of the road, and there should not be a variation by over ¼ of an inch in the surface over this length, and where variations do occur they should be gradual.

Striking Off.—The strike board or sereed is built from 3 to 4 inches wide and about 12 inches high. Its length should be about 2 feet greater than the width of the pavement, and it should be shod on the finishing edge with an iron strap from ¼ to ½ inch in thickness (see Fig. 1). It should have a crown about one-quarter of an inch greater than the crown of the pavement, in order to allow for deflections when it is used as a tamper. Substantial handles should be attached at each end of the strike board.

The following method is used for striking off and tamping the pavement surface: Have the spreaders keep a small wave about one inch high in front of the strike board the first time over, making sure that no daylight appears between the concrete and the board. The first time over, advance the strike board with a combined longitudinal and crosswise motion, this first passage leaving the surface a series of small transverse waves with a slight excess of concrete. Sometimes when too much concrete is deposited in front of the board it is necessary to first pull the concrete down to an approximate surface by means of the strike board, this being performed by a straight pull ahead on the board. On the second or return passage the board is used as a tamper to compact the surface, this being performed as follows:

One of the strike board men holds his end of the board on the side form, while the other tamps the concrete by a succession of short, quick up and down strokes, at the same time advancing his end about 2 or 3 inches each stroke, the total advance being three or four feet. This operation is then repeated by the other strike board man moving his end ahead, while the first man pivots his end on the side form. In this manner the entire surface is tamped, each man covering a series of fan-shaped sections. This tamping fills all pockets and pushes down all protruding stones. The strike board is then passed over the surface using the same motion of the strike board as in the first passage over the slab, and making sure that, during this passage, it rests on the side forms at all times.

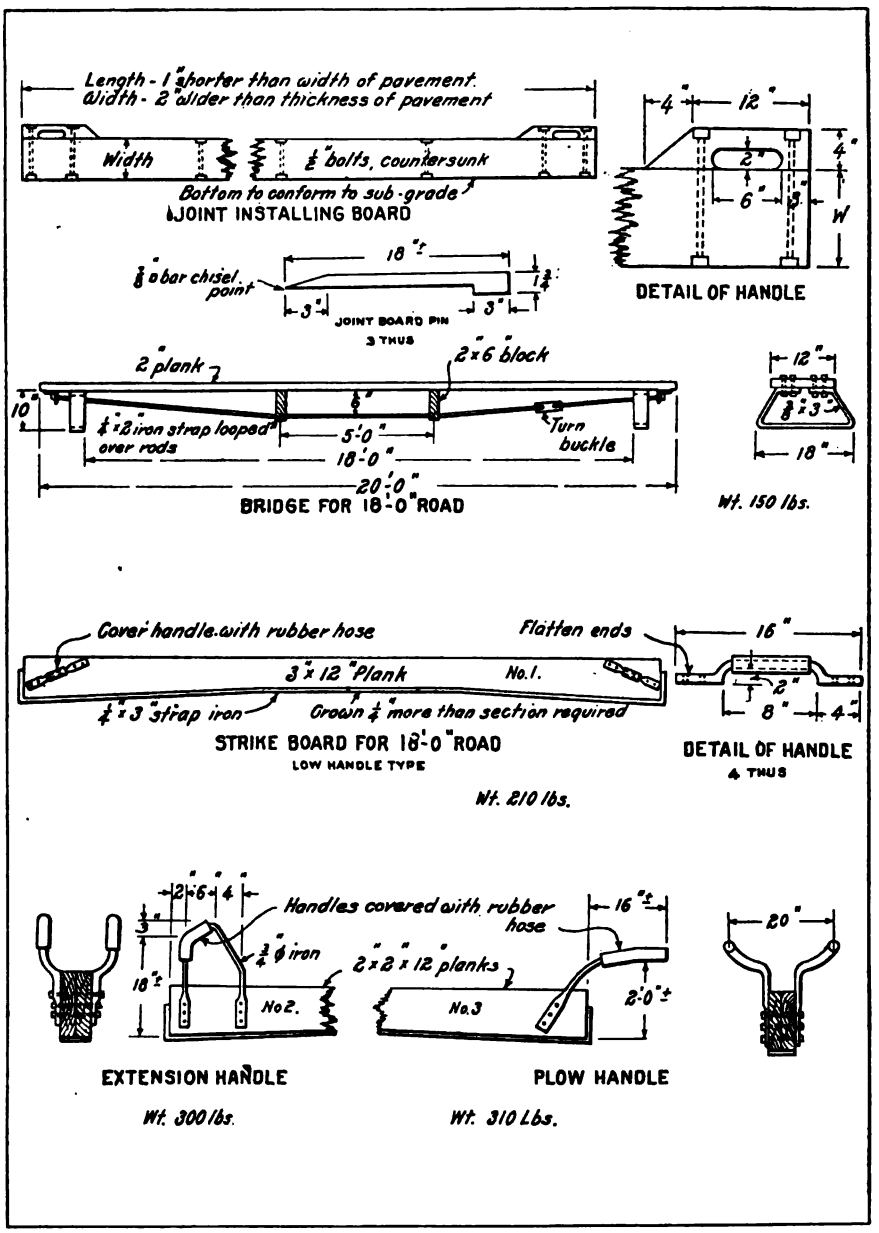


FIG. 1—TOOLS USED IN THE CONSTRUCTION OF CONCRETE PAVEMENTS.

It is sometimes necessary to pass the strike board over the surface four or five times in order to get the desired results, but ordinarily the three passages above described are sufficient.

Rolling.—After striking off the pavement it should be rolled. This is done with a roller 10 to 12 inches in diameter, about 6 feet long, and weighing about 1 pound for each inch in length. The roller is provided with a long handle which enables the operator to reach across the pavement. In rolling, roller is advanced about 2 feet for each complete passage (see Fig. 2.) Do not use the roller too soon after striking off the pavement, as this tends to flatten the crown. The proper time varies from one-half hour to two hours after the concrete is placed. The roller facilitates the use of the finishing belt, especially where crushed stone is used, as it pushes down the sharp projecting edges and corners. It is possible to use the roller much sooner where crushed stone is used than where gravel is used.

The roller often causes longitudinal waves adjacent to the side forms at the end of each crossing. These should be eliminated with a hand float before the application of the finishing belt. (See Fig. 2.)

(To be continued)

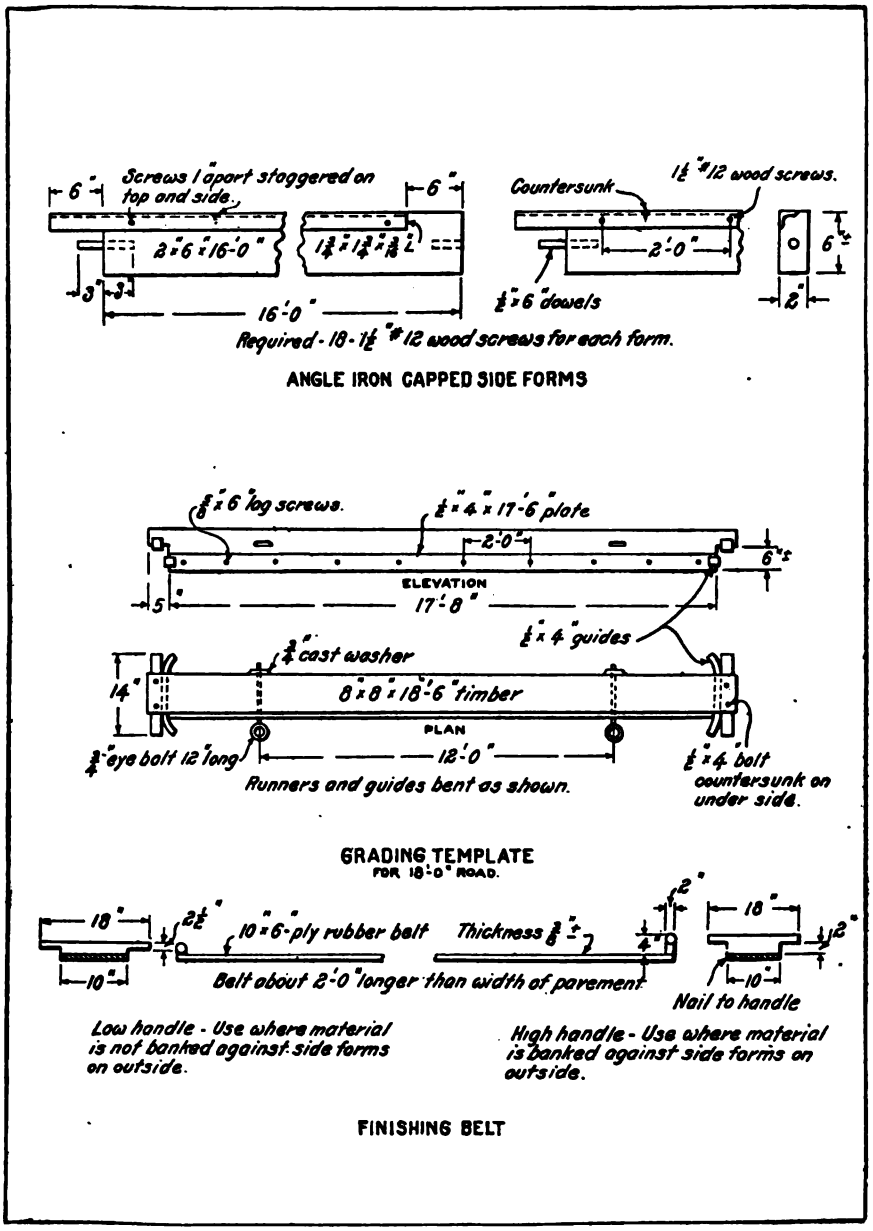


FIG. 2—TOOLS USED IN THE CONSTRUCTION OF CONCRETE PAVEMENTS.

RED COATS FOR RODMEN.

By W. A. HARDENBERGH.

During a large survey in North Carolina, which involved a considerable amount of topographical work by the stadia method in wooded country, the problem of finding the rodmen through the telescope was a very important one. The time spent in locating rodmen was costly (the party contained a transitman, a recorder, four rodmen and two axemen generally), while the distance at which the rod carriers could be discerned limited the amount of territory that could be surveyed from a given set-up, requiring additional set-ups.

Strange as it may seem, the major difficulty was not in reading the rod, once it was located, but in finding it through the thick brush in this mountainous area of the country. With practice, the red and white boldly painted rod could be read when only a small strip showed through the leaves and twigs. Waving the rod and similar devices were, of course, resorted to.

A solution of the problem was discovered by accident. One of the rodmen ordered through a mail-order house a light flannel coat for fall wear while working, the color being a brilliant scarlet. The superior ease with which he could be located while wearing this coat was astonishing. A little investigation showed that he was giving 20 per cent to 25 per cent more shots, at longer range, and with less time lost in locating than any other rodman, though, as a rodman, he was not by any means the best in the crew. His superiority was due entirely to the ease with which he could be seen.

Before the war these light flannel coats, with a large pocket on either side and a smaller one above, could be bought for about $2.50 to $3. They are peculiarly adapted for use by rodmen, or by other surveyors, by reason of their lightness, warmth and general handiness, and, when working on topographical (as stadia) surveying in wooded country, supplying them for the rodmen is economical, since they increase the efficiency of the men to such a great extent, approximately by 20 per cent, and thus pay for themsleves in only a week or two.

SMALL MUNICIPAL BLACKSMITH SHOP.

Until May 1st, 1918, Waltham, Mass. had 31 horses in its street department. At that time three trucks and a touring car were purchased and 10 of the horses sold. At about the same time a blacksmith shop was installed in the stable yard, the equipment costing about $600. Since then, all horses owned by the city (including several besides the 21 owned by the street department), have been shod in this shop and all the blacksmith work of all departments has been done there. The total number of horses shod between May 1st and January 31st, 1919, was 251, the cost of which was $794.33, making a saving

in the city's horse shoeing bill of 21 per cent. A saving was also made in other work done in the shop, on which the blacksmith was engaged for 883 hours during the nine months. The shoeing done comprised 800 plain shoes, 172 bar shoes, 12 neverslip shoes, and 21 drive calk shoes; in addition to which 122 rubber pads were applied, 174 leathers, and 216 shoes were reset.

The acting superintendent of streets, Henry F. Beal, is apparently satisfied that, even for a city as small as 32,000, a municipal blacksmith shop can be made a paying investment.

DISINFECTION OF WATER SUPPLIES

Data Concerning Use of Chlorine for Public Water Supplies—Incompleteness of Typhoid Statistics —Causes of Typhoid Other Than Water.

In the June 7th issue we quoted a number of opinions by waterworks officials in the various parts of the country concerning the effectiveness and desirability of the use of chlorine, either as hypochlorite or liquid chlorine. Something over one hundred officials sent information concerning their use of disinfectants, and the accompanying table shows the facts as presented by eighty-eight of them, the others not having kept records of the use of such material on which to draw for information.

We were somewhat surprised to learn from these replies of health department officials, how many of them had no records of typhoid cases or deaths. Certainly it would seem as though any state or local health board were very delinquent in its duty if it did not use its utmost endeavor to obtain all the information available concerning typhoid within the districts under their charge, and yet more than ten per cent of the health officers reporting to us admitted that they had no such records. Without evidence as to how much typhoid there is to combat, or figures to show for the encouragement of health officials that their efforts are resulting in a reduction of typhoid, any effort to eliminate the disease must be greatly handicapped.

While every state, we suppose, has laws requiring the reporting of every death and the cause thereof, and while these are very generally enforced with considerable success, regulations for reporting cases of disease like typhoid are either insufficient or insufficiently enforced in the majority of cities. This has been apparent to us for a number of years from reports inspected, but is emphasized by many of the figures secured by this questionnaire. In the majority of instances where it is known that all typhoid cases are reported, it is found that on an average about 90 per cent of the cases recover, while a southern physician and health officer has informed us that in southern districts, where physicians have had more experience with typhoid, the recoveries will frequently run as high as 95 per cent. One southern city, however, indicates by the figures reported that the mortality varied from 13 to 50 per cent of the cases. In another one, where the mortality ran from 5 to 14 per cent for a series of years, another series of consecutive figures following this period showed a mortality from 35 to 50 per cent. In both of these cases it seems almost certain that the only explanation is that, while the numbers of deaths were reported more or less completely, a very considerable percentage of the cases which did not result in death were not reported at all. On the other hand, some of the cities show a very commendable ratio which indicates that the physicians are very particular in reporting all cases, thus making a record which proves their efficiency in treating the disease; in contrast to the evidence of the figures in the cases just mentioned, which figures, if correct, would indicate that the physicians of the city were criminally inefficient. In Atlantic City, for instance, the number of cases and deaths respectively, for a number of years, are as follows: 42, 0; 59, 5; 50, 7; 94, 5; 47, 2; 53, 4; 26, 3. These figures show a death rate which averages considerably below 10 per cent, and in only one year runs as high as 14 per cent. It would seem as though health boards, by explaining to their local physicians how failure to report all cases makes the figures show up greatly to their disadvantage as physicians, could secure a more faithful compliance with the regulations concerning the reporting of such cases.

One of the features of the report that was impressive by its frequency of repetition was the claims by the health officers that a large percentage of the typhoid cases in the city were not due to the water supply. Hartford, Conn., reported: "The increase in typhoid cases in 1914 and 1915 was due to milk epidemics. The decrease in the typhoid cases following the chlorination of our water supply of 1914 is probably not connected with the improvement of the water system, but is due to extensions of the sewerage system of the city, which were completed at that time, and to improvements in sanitary conditions of summer resorts visited by a large proportion of our population. It had not been considered that our water supply had been a source of typhoid, although conditions were such that it was opened to infection, and for that reason the chlorination of the entire supply was instituted." Terre Haute reports: "86 per cent of all fatal typhoid cases, from 1908 to 1918, were either hospital or imported cases, or were on premises supplied exclusively with water from private wells, of which there is a great number. Our supply comes from the Wabash river, which at flood stages carries a large amount of matter in suspension. We favor the use of chlorine more in our case as a precautionary measure." Cedar Rapids, Ia., says: "Nearly all of the cases of typhoid have been traceable to the use of water from private wells." In New Orleans, "The water is filtered and really has no need of the treatment, except that a certain portion of it is stored in a masonry lined and covered clear-water resevoir, the roof of which is covered with earth, so that a very small amount of seepage through this earth cover gives a few gas formers indicative of coli under the U. S. Public Health regulations for common carriers." Concerning Baltimore, assistant commissioner of health Howard says: "Filtration and chlorination should not be credited by any means with all the improvements in the typhoid rate. During this period, 1910 to 1918, the sewerage system has come into use, and over 40,000 privies put out of use, the milk much improved, flies reduced, and much better control of cases exercised by the health department. During the same time, typhoid in rural Maryland has decreased. Many cases of typhoid in Baltimore have been traced to the counties, and the Baltimore typhoid death rate is largely influenced by deaths of cases sent in from the counties for treatment." Similarly, Ann Arbor reports: "We have two large state hospitals to which patients come from this and adjoining states, so that quite a percentage of the cases are imported." Of Battle Creek it is stated: "For the last five years, careful investigation of every case of typhoid fever has proved that scarcely one originated in Battle Creek. Nearly every case was a non-resident who came here during his incubation period, or in some cases suffering from the disease when he came to the city." Also it is said that less than one-third of the cases in Duluth originate in that city, but the rest are shipped in from the surrounding territory.

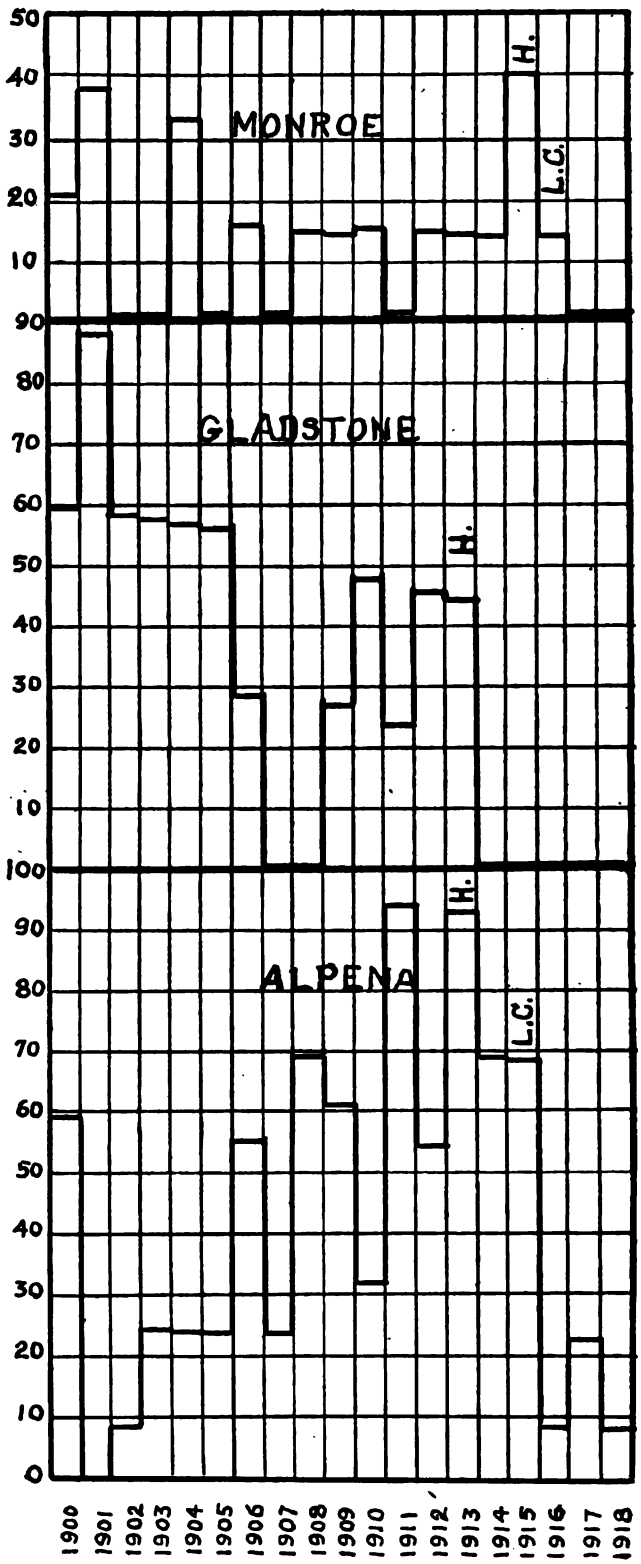
Such statements as these go far toward explaining the failure of chlorine to reduce the typhoid death rate to approximately zero in the cities where it is used, or even to effect any reduction at all in such figures in many cases. Chlorine, of course, affects the water supply only, and cases which are not due to the water cannot be prevented by the use of chlorine or any other disinfectant. The lesson from conditions reported would seem to be that the use of disinfectants should be more widespread, and should be carried into cities, towns and country districts where most of the typhoid cases originate.

A number of the cities began using hypochlorite as a disinfectant, but most of these have changed over to liquid chlorine. Among these are Terre Haute, Ind.; Ann Arbor, Battle Creek, Grand Rapids, Marine City, Marquette, Menominee, Monroe, Munising, Negaunee, Port Huron, St. Clair, St. Joseph and Traverse City, Mich.; Independence, Mo.; Ithaca, Poughkeepsie and Yonkers, N. Y.; Goldsboro, N. C.; Sandusky, O.; Rutland, Vt.; Newport News, Va. Several explain their reasons for changing. W. W. Brigden, superintendent of the Battle Creek waterworks, says: "We used hypochlorite of lime several years, but it was a dirty job to take care of it, and also the sludge was objectionable. It was very corroding on pipes. Our engineer claimed he was made sick by it several times. We then put in a liquid chlorine plant. It has worked fairly well, and while we purchased the plant before liquid chlorine plants were perfected, we are well satisfied." Still further improvements are anticipated by G. E. Willcomb, chief chemist of the Bureau of Water of Albany, N. Y., who writes: "The use of liquid chlorine is the most popular at the present time, but the difficulties of keeping the applying mechanism of this process free from leaks, and the attending dangers to the operators may cause this process to be discarded in the near future, in favor of the procedure of obtaining the chlorine on each particular job by the electrolytic dissociation of a salt solution." On the other hand, however, a number of superintendents said that the liquid chlorine plants are operated without any difficulty or objectionable features and with very little attention.

Seattle, Wash., which derives its water from the mountains, states that chlorine is used by the city simply as a safeguard, and is kept operating throughout the year so that the men in charge of the apparatus may not become rusty in their knowledge of its operation, but only sufficient chlorine is used to effect this purpose and to insure that the apparatus will be in working condition should disinfection really become necessary. On the other hand, Greenville, S. C., reports that for the last four years, the few cases of typhoid that developed in the city have been traced to outside sources; and as the number of cases was so small and the character of the water so good, they have abandoned the use of chlorine. A rather peculiar case is that of Sandusky, O., which had an epidemic in 1911, and attributed it to the fact that the filtration plant was out of operation for several weeks for repairs, and the use of chlorine was discontinued at the same time. It would seem as though, if there is ever a time when the use of chlorine would be necessary, it would be during the discontinuance of filtration.

In Cincinnati, O., disinfection was practiced intermittently, from three to seven months a year, during the years 1911 to 1917, except that it was used continuously in 1915; but since the beginning of last year it has been used continuously, and this practice is expected to be continued.

Yonkers, N. Y., has two sources of supply, one of which is filtered, and both of which have been chlorinated since 1917, although only one of the sources was so treated between 1910 and 1917. Ellenville, N. Y., derives its supplies from two brooks, but applies chlorine to only one of them. New Haven, Conn., has eight sources of supply, and chlorination of one of these was begun in 1914, and has gradually been extended to the other sources, and for the past year all the supplies have been so treated.



TYPHOID DEATH RATES PER 100,000 POPULATION
For three Michigan cities. Figures will be found in the table on the opposite page. Notes were given in last week's issue.

USE OF CHLORINE FOR MUNICIPAL WATER SUPPLIES.

City and State	Population 1910	Population 1918	Began use of chlorine	Use discontinued	Other treatment	Deaths from Typhoid — Years Before Use of Chlorine: 5	4	3	2	1	Years After Use of Chlorine: 1	2	3	4	5
Alabama:															
Talladega	5,000	6,500	1915	2 mos. of 1916, supply exhausted	None	..	..	..	..	7	4	10	2	..	..
Eufaula	6,000	6,419	1916	No	None	..	..	..	..	..	..	..	..	..	..
California:															
San Jose	28,946	41,000	1916	Yes	....	..	..	..	2	2	1	0	..	..	..
Connecticut:															
Hartford	98,915	129,353	1913	No	None	19	10	19	20	13	19	††13	††7	12	8
New Haven	133,600	165,000	1914§§	....	....	26	24	32	34	16	27	12	14	8	..
Illinois:															
Chicago	2,195,551	2,596,681	1912	No	None	..	..	271	300	241	249	167	132	128	43
Indiana:															
E. Chicago	25,000	43,000	1907	Yes	None	..	..	1	1	11	8	0	2	6	5
Indianapolis	289,000	300,000	1909	No	Filtration	..	..	..	..	..	70	63	45	62	57
Terre Haute	58,000	66,000	1911	No	Filtration	..	*	19	34	15	16	15	15	13	16
Iowa:															
Burlington	24,000	25,000	1912	No	Filtration	..	..	..	..	..	..	..	..	..	..
Cedar Rapids	32,811	45,000	1916	No	Filtration	8	11	8	3	6	10	5	..	..	..
Kansas:															
El Dorado	3,000	18,500	1918	No	Filtration	..	..	..	..	..	..	..	..	..	..
Louisiana:															
New Orleans	378,000	384,000	1915	No	Filtration	38	25	58	112	112	87	32	77	..	..
Maryland:															
Baltimore	559,530	599,653	1911	No	Filtration	183	230	180	136	235	136	140	130	128	107
Cumberland	21,938	27,298	1914	No	Filtration	..	34	22	14	20	4	3	3	3	..
Massachusetts:															
Lawrence	85,892	90,259	1919	No	Filtration	4	5	6	6	10	..	..	..	..	..
†Michigan:															
Adrian	10,763	11,662	1916	....	Filtration	27	0	19	18	17	17	26	..	..	..
Alpena	12,706	13,450	1913	....	....	69	61	32	94	54	69	68	7	22	7
Ann Arbor	14,817	15,072	1912	No	None	7	7	21	40	14	0	14	14	53	26
Battle Creek	26,000	30,900	1914	No	None	30	28	15	23	43	17	7	25	7	..
Bay City	45,166	55,000	1916	No	None	39	63	15	34	21	19	17	..	..	..
Cadillac	8,375	10,351	1919	....	....	43	0	10	40	..	..	..	..	..	..
Escanaba	13,194	16,525	1914	....	Filtration	215	60	44	36	63	27	45	37	31	..
Flint	38,550	60,000	1916	....	Filtration	19	24	15	26	10	44	22	..	..	..
Gladstone	.....	5,123	1913	....	....	0	27	48	23	45	0	0	0	0	0
Grand Rapids	112,571	133,355	1913	No	Filtration	31	18	28	26	34	27	28	15	13	8
Highland Park	4,128	38,000	1915	No	....	24	0	19	28	9	8	3	5	..	..
Hillsdale	5,001	5,257	1917	....	....	19	0	19	0	0	0	..	..	..	..
Ironwood	12,821	14,321	1917	....	Filtration	8	7	35	21	27	0	..	..	..	..
Ludington	9,132	11,334	1912	....	....	14	54	41	22	42	10	19	10	9	17
Manistique	.....	4,890	1918	....	....	0	0	0	21	0	..	..	..	..	..
Marine City	.....	3,778	1913	....	....	109	54	53	53	80	80	53	106	80	0
Marquette	11,503	12,681	1911	Several times	....	17	63	44	53	95	110	33	17	33	40
Menominee	10,507	8,586	1910	....	....	47	68	92	64	67	77	20	10	31	20
Monroe	6,893	7,928	1915	....	....	15	0	14	14	13	13	0	0	..	..
Munising	.....	4,180	1913	For 2 years	....	0	67	32	0	379	0	53	51	0	24
Negaunee	8,460	11,677	1914	....	....	0	71	23	11	32	0	26	0	..	..
Niles	5,156	5,843	1918	....	....	0	36	18	0	0	..	..	..	..	..
Petoskey	.....	4,250	1918	....	....	65	21	20	0	19	..	..	..	..	..
Port Huron	18,863	18,618	1912	....	....	14	52	74	48	200	27	0	21	32	5
St. Clair	.....	2,633	1913	....	....	185	426	38	76	76	0	14	0	11	0
St. Joseph	5,936	6,759	1912	....	....	55	18	36	102	0	64	32	16	15	15
Sault Ste. Marie	12,615	14,339	1918	....	....	33	39	7	7	28	..	..	..	..	..
South Haven	.....	3,317	1912	....	....	56	85	29	56	141	0	29	0	30	0
Traverse City	12,115	14,346	1913	....	....	59	33	25	33	24	0	0	15	14	7
Trenton	.....	1,256	1918	....	....	243	0	80	0	0	..	..	..	..	..
Wyandotte	8,287	12,103	1914	....	....	122	96	12	54	92	47	63	62	107	..
Minnesota:															
Duluth	78,446	100,000	1912	No	None	..	..	16	25	19	21	16	10	7	4
Mississippi:															
Vicksburg	20,814	24,000	1917	No	Filtration	..	..	..	..	..	..	..	..	..	..
Missouri:															
Independence	9,859	14,000	1910	No	Sedimentation	..	..	..	..	..	..	..	..	..	..
St. Louis	687,029	820,000	1914	No	Filtration	101	95	108	74	122	52	71	58	54	..
Nebraska:															
Omaha	124,096	160,000	1909	No	Sedimentation	..	..	..	..	..	..	..	..	..	..
New Jersey:															
Atlantic City	51,667	58,000	1916	No	None	3	4	4	3	5	6	2	..	..	..
Rahway	9,337	11,000	1907	No	Sedimentation	..	..	..	2	6	0	1	2	1	0
Trenton	96,515	113,974	1914	No	Filtration	25	34	32	20	15	6	3	6	5	..
New York:															
Albany	107,000	112,000	1909	No	Filtration	..	19	16	20	11	15	18	18	28	18
Buffalo	423,715	475,781	1914	No	None	96	86	108	50	68	46	51	48	37	..
Ellenville	3,000	3,114	1917	On one of 2 sources	None	0	0	1	0	0	1	..	..	..	..
Ithaca	14,700	17,500	1913	No	Filtration	1	4	4	2	3	5	6	§2	3	1
Johnstown	10,000	10,800	1918	No	None	0	0	0	0	0	..	..	..	..	..
Newburgh	25,580	30,000	1913	No	None	10	12	13	11	11	6	6	0	0	4
Niagara Falls	30,445	55,000	1912	No	Filtration	34	24	26	31	55	10	4	0	5	5
Poughkeepsie	27,936	35,000	1908	No	Filtration	..	..	9	9	..	6	5	4	4	3
Rome	20,497	25,000	1917	No	None	..	..	2	1	2	2	..	..	..	..
Yonkers	79,800	95,092	1913	No	Filtration	7	5	14	8	6	4	8	2	5	2
North Carolina:															
Goldsboro	7,000	11,000	1916	No	Filtration	..	..	..	..	..	..	..	..	..	..
‡Wilmington	25,748	32,473	1914	No	Filtration	..	..	101	36	50	9	12	9	28	..
Ohio:															
Cincinnati	362,000	414,600	1911	5 to 9 mos. a year	Filtration	239	157	64	46	21	28	24	23	29	13
Cleveland	560,663	810,306	1911	No	Filtration	93	84	64	67	105	35	83	53	54	36
Dayton	117,000	143,000	1917	....	None	22	18	11	18	26	9	..	..	..	..
Lima	30,500	50,000	1910	No	....	5	10	6	2	5	8	7	6	11	4
Sandusky	19,000	22,000	1912	No	Filtration	59	234	78	34	147	27	27	10	8	10
Springfield	47,076	53,042	1917	No	Filtration	..	14	10	6	16	9	..	..	..	..
Washington C. H.	7,000	8,000	1917	No	None	..	..	..	..	..	..	..	..	..	..
Oklahoma:															
Oklahoma City	64,000	110,000	1912	No	Sedimentation	..	..	..	..	40	16	24	17	7	16
Pennsylvania:															
Connellsville	12,845	16,500	1915	No	Filtration	5	2	2	1	27	0	1	0	..	..
Greenville	5,909	9,504	1913	No	Filtration	11	14	10	14	19	12	14	25	19	5
Harrisburg	64,186	78,154	1906	No	Filtration	..	43	40	20	17	28	30	18	21	10
Philadelphia	1,549,908	1,761,368	1913	No	Filtration	533	331	272	230	205	124	109	128	108	84
South Carolina:															
Greenville	16,000	25,000	1917	....	None	1	6	5	5	1	7	..	..	..	..
Texas:															
Fort Worth	110,000	130,000	1913	No	Filtration	..	..	..	45	45	20	33	19	21	29
Marshall	11,440	16,000	1917	No	None	..	..	..	..	..	..	..	..	..	..

(*Continued on page 444*)

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Hav Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles or any length or importance which have appeared in all the American periodicals and the leading ones published in other countries, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on muncipal matters. In furtherissues of the paper, the price given is forere an article is continued in two or three named after each article, except that whance of this we will furnish any of the articles listed 'n the index for the price each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its given, and the name of the author whencontents is added. The length also is it is a contributed article.

ROADS AND STREETS.

Designing:

Design and Construction of the Dixie Highway from Rockwood to Monroe, Mich. Sending trucks overland; temporary macadam road and permanent concrete road; method of widening and superelevating curves. By Leroy C. Smith, engr.-mgr., Wayne County, Detroit. 2 ills., 1,700 words. Municipal and County Engineering, May. 25 cts.

Illinois Adopts a Uniform Basis of Design for All Types of Rigid Pavement. Concrete standardized, other types designed to equal it in load-carrying capacity; flexural strength to govern; brick and bituminous concrete on concrete base only other types considered for main road. By Clifford Older, chief highway engr., Dept. of Public Works and Bldgs., Ill. 2,800 words. Engineering News-Record, May 8. 20 cts.

Experiences of California Highway Commission with 4-inch Concrete Base. Thin bases have given admirable service and have proved their economy under California conditions whenever subgrade has been firm and hard and the concrete has remained in contact with subgrade. 600 words. Engineering and Contracting, May 7. 15 cts.

Super-elevations and Easements. Description of field methods of constructing pavements with banked and easement curves. By G. A. Curtis, dist. engr., Mass. Highway Comn., Pittsfield, Mass. 5 ills., 1,500 words. Good Roads, May 10. 10 cts.

Contour Method of Relocating Roads. Interesting discussion of methods used in relocations given by Gordon F. Daggett, engineer of surveys, Wisconsin Highway Commission, from which these notes are taken, 1,600 words. Engineering and Contracting, May 7. 15 cts.

Drainage:

Some Specific Suggestions on the Drainage of Roads. Quality of soil has important influence on proper method of drainage and type of foundation to be employed, and much study must be devoted to nature, type and character of soils through which road is to be built. 1,700 words. Municipal and County Engineering, May. 25 cts.

Drainage System for Improved Country Highways. Tile underdrainage would protect the surface, decrease the cost of roadside maintenance, and remove dangerous ditches. By W. P. Blair, vice-pres., National Paving Brick Manufacturers' Ass'n., Cleveland, O. 1 ill., 1,000 words. Engineering News-Record, May 8. 20 cts.

The Importance of Adequate Drainage and Foundation for Road and Street Surfaces. Rigidity in a road surface cannot be obtained without suitable underdrainage; roads on fills should be drained as well as in cuts; drainage too often neglected. Form Municipal and County Engineering, by C. Richardson, the Barber Asphalt Paving Co., N. Y. 4,500 words. Canadian Engineer, May 15. 15 cts.

Finances:

The Cost of a Mile of Road. With charts showing annual cost, including interest on construction cost, cost of maintenance and traffic, and total cost of traffic per ton mile, including transportation costs for various types of surfaces. 3 charts, 1,000 words. Engineering and Contracting, May 7. 15 cts.

The Present Level of Prices. There is unfortunately a marked degree of suspicion in the minds of the public; cost of delay in proceeding with road-building programs is more serious than the increased cost of construction. S. M. Williams, pres., Highways Industries Ass'n., Washington, D. C., 2,500 words. Canadian Engineer, May 8. 15 cts.

Unit Bidding Prices and Labor and Material Prices for State Road Work. Extracts from replies to a letter sent in April to various state highway departments. 1,000 words. Engineering and Contracting, May 7. 15 cts.

Prices of Paving and Paving Materials. Some figures comparing conditions during the past six years in fifteen cities of the Middle Atlantic states and some others, and forecasts for 1919. 1,500 words. Municipal Journal and Public Works, May 3. 10 cts.

State Roads Without Bonds. Vermont has always paid for road work as it was finished and pays special attention to maintenance. 200 words. Municipal Journal and Public Works. May 3. 10 cts.

Bonding Companies and Road Contractors. Some pertinent information regarding relation of surety company and contractor given by Edward W. Bush, engr., Aetna Casualty & Surety Co. in discussion at American Road Builders' Ass'n. 600 words. Engineering and Contracting, May 7. 15 cts.

Guarantees:

Pavement Guarantees. Only about one-third of municipal and county engineers favor guarantees. 150 words. Municipal Journal and Public Works, May 17. 10 cts.

Economic Status of guarantees for Pavements on Roads and Streets. Committee report at convention of American Road Builders' Ass'n. 2,800 words. Good Roads, May 10. 10 cts.

Pavement Guarantees. Practices of Counties throughout the country as to requiring them, and opinions of county officials as to desirability of them. 1,300 words. Municipal Journal and Public Works, May 17. 10 cts.

Construction:

Government Machinery for State Highways. Under federal road act amendments, the Secretary of War was authorized to transfer to the Secretary of Agriculture, war material, equipment and supplies not needed by War Department but suitable for use in highway improvements. 300 words. Municipal Journal and Public Works, May 10. 10 cts.

Methods of Grading for Roads Across Sloughs. Some deductions as to costs and methods that may be of interest to contractors and engineers; most common procedure is by bull-dosing or pushing the grade. By L. U. Martin. 1 ill., 1,000 words. Engineering and Contracting, May 7. 15 cts.

Convict Labor on Highway Work; Organization, Administration, Camps and Cost Data. Committee report at the meeting of the American Road Builders' Ass'n. 2 ills., 1,800 words. Good Roads, May 3. 10 cts.

Road Machinery. American highway officials must face high wages for unskilled labor for several years, hence the need for labor-saving machinery; selection of equipment should be based upon consideration of certain factors, such as character of work, specification requirements, portability of plant, transportation facilities, etc. Paper before Canadian Good Roads Congress, by A. H. Blanchard, consulting engr., N. Y. C. 3,000 words. Canadian Engineer, May 29. 15 cts.

Maintenance:

Highway Maintenance. Should begin the day the road has been completed; strict meaning of "permanent;" preventing surface wear; rules for carpet coat. Paper before Canadian Good Roads Congress, by J. A. Duchastel, city manager, Outermont, P. Q. 2,000 words. Canadian Engineer, May 29. 15 cts.

New Pennsylvania Highway Commissioner Will Not Tolerate the Ripping Open of New Pavements. Lewis S. Sadler has declared that there will be absolutely no deviation from the rule that no permanent pavement be put down until every pipe or sewer connection is made on thoroughfare to be improved. 600 words. Municipal and County Engineering, May. 25 cts.

Macadam Stone Treated with Deliquescent Salts. Roads at Detroit naval training station surfaced with this material have noiseless and dustless surface. By H. H. Edwards, highway engr., Chicago. 1,200 words. Engineering News-Record, May 15. 20 cts.

Parking Automobiles Ruins Asphalts. At recommendation of superintendent of asphalt, W. H. Eagle, of Columbus, O., an ordinance has been adopted changing the parking space from center to south side of street. 300 words. Municipal Journal and Public Works. May 17. 10 cts.

Pennsylvania Traction Engine Regulations. Aimed to protect highways from destruction by traction engines; amendments agreed on at conference of representative of State Highway officials and traction engine manufacturers. 300 words. Municipal Journal and Public Works, May 24. 10 cts.

Keeping the Highways Open in Winter. No more to be doubted today than was wireless telegraphy; solid road surface to work upon will be necessary; possible utilization of tanks. By Hon. F. Carrel, vice-pres., Canadian Automobile Ass'n. 1,600 words. Canadian Engineer, May 29. 15 cts.

Calcium Chloride in Connecticut. Experiences with its use in that state, as described by the superintendent of repairs of the state highway commission. 800 words. Municipal Journal and Public Works, May 31. 10 cts.

Method of Maintaining Michigan State Reward Roads. Outlined by L. H. Neilsen, state maintenance engineer, in report of the State Highway Commission. 900 words. Engineering and Contracting, May 7. 15 cts.

Bituminous Roads:

Bituminous Carpets on Concrete Roads. Still a debated question whether a thin bituminous carpet should be laid at all on concrete. 200 words. Engineering and Contracting, May 7. 15 cts.

Hot Mix Asphalt Pavements. Existing pavements utilized; mineral aggregates; types of hot mix pavements. Abstracts from paper before Sixth Canadian Good Roads Congress, by F. P. Smith, consulting engr., N. Y. 4,000 words. Canadian Engineer, May 22. 15 cts.

Bituminous Macadam. Nowhere extensively used until little more than ten years ago when change in vehicular traffic made necessary construction of surface to withstand new destructive forces; preparation of foundations; laying first and second course; precautions. By A. W. Dean, chief engr., Mass. Highway Commission. 1,800 words. Canadian Engineer, May 22. 15 cts. 1,800 words, Good Roads, May 31, 10 cts.

Oil Construction for the Streets. Surface treatment of old water-bound macadam; new oil-bound macadam; conditions under which each is used; financial and other advantages of the use of oil. By Chas. W. Geiger. 4 ills., 1,600 words. Municipal Journal and Public Works, May 31. 10 cts.

Defects in Surface of Bituminous Pavement Due to Concrete Base. Data collected at Oak Park, Ill., indicate that cracks and other objectionable features are a minimum where flexible foundations are used. By H. W. Skidmore, construction engr., Dept. of Public Works, Oak Park. 1 ill., 2,000 words. Engineering News-Record, May 1. 20 cts.

Hot Mix Asphalt Pavements. A technical description of the chief types of asphalt pavement mixed and laid hot. Paper before Good Roads Congress, by

F. P. Smith, Dow & Smith, N. Y. C. 2,600 words. Good Roads, May 24. 10 cts.

Limestone Rock Asphalt Produces Good Mortar. Tests show that it has high strength, light weight and marked impermeability; concrete results unsatisfactory. By J. R. Nash, office engr., State Hwy. Dept., Austin, Tex. 600 words. Engineering News-Record, May 8. 20 cts.

Concrete Pavements:

Concrete Highway Construction Standards Raised. Mississippi Valley state road officials recommend tamped concrete and heavier sections; action affects wide territory. 1,400 words. Engineering News-Record, May 15. 20 cts.

New Requirements in Illinois Specifications for Concrete Roads. Chief of these are requirements for subgrading, for consistency of concrete and for placing concrete pavement. 700 words. Engineering and Contracting, May 7. 15 cts.

Machine Finishing Concrete Roads. Description of machine developed by author and found, after numerous experiments, to be exceptionally advantageous in utilizing suction for the purpose of agitating the concrete mass. By E. G. Carr, consulting highway engr., Lakewood Engrg. Co., Cleveland. 4 ills., 1,200 words. Engineering and Contracting, May 7. 15 cts.

Charging Concrete Mixers on Road Work. Disadvantages of the system of piling materials along the road; hauling proportioned batches directly from railway siding to mixer in narrow-gage cars, motor trucks or platform trucks; tremendous possibilities of this system. By Wm. Ord. Proceedings of the Engineering Society of Wisconsin. 2,000 words. Engineering World, May 1. 15 cts.

Cost of Highway Concrete Delivered Wet by Trucks. Central crushing and mixing plant set up at quarry; concrete aggregate from crusher bin run directly into mixer and thence into trucks. 3 ills., 1,600 words. Engineering News-Record, May 1. 20 cts.

Brick Pavements:

Brick Pavements. Conditions of some pavements in middle west and conclusions drawn by engineers of the Bureau of Public Roads. 2,200 words. Municipal Journal and Public Works, May 10. 10 cts. 1,700 words. Engineering & Contracting, May 7. 15 cts.

General Features of Brick Pavement Construction. Abstracts from an interesting discussion given by A. T. Goldbeck, engineer of tests, and F. H. Jackson, assistant testing engineer of the U. S. Bureau of Public Roads, in report printed in Public Roads, the official publication of the Bureau. 4,500 words. Engineering and Contracting, May 7. 15 cts.

Poor Brick Cause Pavement Failure—The Saving of $50 for Tests Leads to Failure of a $50,000 Job. Views showing comparative results of rattler test of good and bad paving brick at Champaign, Ill. By C. C. Wiley, Associate in Civil Engrg., University of Illinois, Urbana. 4 ills., 800 words. Municipal and County Engineering, May. 25 cts.

Design and Construction of the Monolithic Brick Road South of Seneca, Ill. The hill portion of road; use of steel shod wood drag for grading. By A. H. Hunter, dist. engr., Div. of Highways, Dept. of Public Works and Bldgs., Peoria, Ill. 6 ills., 2,000 words. Municipal and County Engineering, May. 25 cts.

Other Pavements:

Procedure in Constructing an Open Joint Wood Block Pavement at Toledo, O. Paving car tracks; concave track paving; nose block used. By Raymond Pierce, construction engr., Russel & Jennison Co., Toledo. 2 ills., 1,200 words. Municipal and County Engineering, May. 25 cts.

Road Material in New Hampshire. Report on a survey of the materials available, with a discussion of their value. By J. W. Goldthwait, prof. economic geology, Dartmouth College. 3,000 words. Good Roads, May 31. 10 cts.

Gravel Roads. Commendable under conditions existing previous to 1913, but unsuitable to use for the construction of main roads under present conditions; specification for county of Middlesex, Ont., 1854. Paper before Canadian Good Roads Congress, by Chas. Talbot, county road supt., London, Ont. 1 ill., 4,300 words. Canadian Engineer, May 29. 15 cts.

Miscellaneous:

Highway Bridges and Heavy Motor Traffic. The committee on "Methods of Strengthening and Reconstructing Highway Bridges for Heavy Motor Truck Traffic" in report at American Road Builders' Ass'n., estimated 80 per cent. of the 400,000 public highway bridges in the country are unable to carry modern heavy trucks with safety. 2,200 words. Engineering and Contracting, May 7. 15 cts.

Pennsylvania Highway Bridges. State highway department will open bids for 43 bridges to be located in 11 counties which will be amply strong to carry the heaviest motor trucks. 200 words. Municipal Journal and Public Works, May 31. 10 cts.

Sidewalk Construction for New Boulevard Link, Chicago. Of particular interest because it is being done very efficiently under severe restrictions; concrete 1-2-4 mixture with 1-1 mixture of cement and granite screenings. 1 ill., 1,000 words. Engineering and Contracting, May 7. 15 cts.

Design of Concrete Sidewalks and Concrete Curb and Gutter at Street Intersections. Description of the development of a large tract of ground into improved city property in Terre Haute, Ind., by the engineer in charge of the work, W. R. Paige, civ. and consulting engr., Terre Haute. 3 ills., 1,000 words. Municipal and County Engineering, May. 25 cts.

Center Gutter Construction Used on Bituminous Street. Sidewalks with unequal exposure utilized as curbs on narrow streets; plan helped to save trees and was economical. By W. D. Johnston, city engr., Waterloo, Ia. 2 ills., 500 words. Engineering News-Record, May 15. 20 cts.

Houston Against Federal Commission Plan. Secretary of Agriculture believes establishment of a federal highway commission impracticable and unnecessary; claims existing machinery satisfactory for administering federal aid. 2,500 words. Good Roads, May 24. 10 cts.

Federal Aid Road Act Regulations. Latest regulations prepared by the Office of Public Roads for carrying out this act as recently amended. 2,300 words. Municipal Journal and Public Works, May 31. 10 cts.

The Relation of Highways to Motor Transport Efficiency. For a national system of highways; types and width of roads; uniform highway traffic laws. From paper at Conference on Modern Methods of Motor Transportation, by A. H. Blanchard, consulting highway engr., N. Y. C. 2,000 words. Municipal and County Engineering, May. 25 cts.

Texas Highways Under Construction. 80 projects totaling 1,126 miles to cost $4,862,474. 100 words. Municipal Journal and Public Works, May 17. 10 cts.

Provisions for Safety at Grade Crossings. Solved in 8 states by placing responsibility for the cautionary signals on the state, county or municipal authorities. 600 words. Engineering and Contracting, May 7. 15 cts.

Good Roads Will Bind Canada. Improved highways will enable people to know one another better and will aid in the development of our natural resources. By Hon. J. A. Tessier, Minister of Roads, Province of Quebec. 1,200 words. Canadian Engineer, May 29. 15 cts.

Highways and Railways for Defense of Our Nation. National defense plan requiring extensive construction along our borders and coasts is outlined in an illustrated booklet issued by Sauerman Bros., Monadnock Block, Chicago. 500 words. Municipal and County Engineering, May. 25 cts.

A High-Cost Highway. New Jersey, in constructing its section of the Lincoln highway, is spending unusual amount, averaging $66,000 a mile. 200 words. Municipal Journal and Public Works, May 17. 10 cts.

Colleges Should Play a Part in Highway Program. Weakness of road-engineering courses compared with great need for trained road engineers and material inspectors. By R. L. Morrison, prof. of highway engrg., Agricultural and Mechanical College of Texas, College Station, Tex. 1,000 words. Engineering News-Record, May 29. 20 cts.

Backwardness in Road Improvement. Our hard-surfaced roads total only one-tenth as great a length as those of France. 200 words. Municipal Journal and Public Works, May 24. 10 cts.

Experiences in France and England with water-bound and bituminous macadam. Information given by D. T. Black, city engineer of Welland, Ont., at conference of Roads Superintendents and Engineers in Ontario. 400 words. Engineering and Contracting, May 7. 15 cts.

County Highway Data. Supplementary to tables published in the issue of April 19 from information furnished since then; work contemplated, wages, results of heavy traffic, bridge failures and pavement guarantees. 2 pages tables. Municipal Journal and Public Works, May 24. 10 cts.

Proceedings of Canadian Good Roads Congress. Sixth annual meeting, held in Quebec City, attended by official representatives from eight of the nine provinces in Canada; Sir Lomer Gouin's discussion of federal aid creates mild sensation. 5 ills., 9,000 words. Canadian Engineer, May 29. 15 cts.

Effects of Tractive Resistance in Terms of Gasoline Consumption. Amount of gasoline consumed directly related to amount of mechanical work done in traveling over roadway—that is, amount of resistance overcome in a certain space. 3 ills., 700 words. Engineering and Contracting, May 7. 15 cts.

Daily Code Letter Shows Status of All Highway Work. Texas state highway department condenses all daily progress reports into one page by means of alphabetical symbols. By J. Montgomery, div. engr., Texas State Highway Dept. 1 ill., 700 words. Engineering News-Record, May 29. 20 cts.

Utilizing Old Macadam as a Base for Pavements. Can be very cheaply resurfaced if it is loosened by a scarifier and spread by a heavy harrow. 300 words. Engineering and Contracting, May 7. 15 cts.

SEWERAGE AND SANITATION.

Sewage Treatment:

The Sewage Disposal Problem in Chicago. Unsettled controversy with Federal Government; Present situation critical, people unconcerned; treatment works must be built. By C. D. Hill, engr., Board of Local Improvements, Chicago. 1,600 words. Municipal and County Engineering, May. 25 cts.

Sewage Disposal of the Loop District, Chicago. Fundamentals of a new system, prepared by the author and submitted to the City Council; problem of satisfactory disposition of Chicago's sewage becoming more pressing each day; inverted siphons and pumps in sewage system. By C. D. Hill, engr. of construction, Board of Local Improvements, Chicago. 2 ills., 3,500 words. Engineering World, May 15. 15 cts.

Sewage Disposal at Columbus. Some features of report for 1918; purification not sufficient under summer conditions; tank foaming; filter flies. 1,000 words. Municipal Journal and Public Works, May 10. 10 cts.

Something New in Sewage Treatment. Editorial reference to three articles in this and last week's issue on methods of treating sewage, indicating the diversity of methods now available. 400 words. Municipal Journal and Public Works, May 31. 10 cts.

Disposal of Sewage by Treatment with Acid. Miles process is worthy of consideration for cities where large volume of strong sewage is discharged; causes no local nuisance. Paper read before the Boston Society of Civil Engineers, by E. S. Dorr, engr. of sewer service, Boston, and R. S. Weston, of Weston & Sampson, Boston. 7,500 words. Canadian Engineer, May 15. 15 cts.

Results of Experiments with Miles Acid Process of Sewage Treatment. Abstract of an interesting resume given by Edgar S. Dorr and Rob. S. Weston, both of Boston, in the April journal of the Boston Society of Civil Engineers. 5,000 words. Engineering and Contracting, May 14. 15 cts.

Acid Treatment of Sewage. Deoxygenating effect, comparison with Imhoff and activated sludge, and other features discussed by E. S. Dorr, R. S. Weston and H. W. Clark. 1,200 words. Municipal Journal and Public Works, May 24. 10 cts.

Operation of Fine Sewage Screen at Long Beach, Cal. Tests indicate that screens remove 16.3% of solids; screenings incinerated by gas; operating costs. 1,300 words. Engineering News-Record, May 22. 20 cts.

Sewage Treatment at Bridgeport. History of the studies of the problem; Imhoff tanks first proposed; fine screens finally adopted and under construction. By J. A. McElroy, city engr. 900 words. Municipal Journal and Public Works, May 24. 10 cts.

Insect Aid to Filtration. On several English percolating filters ponding is entirely prevented by the achorutes; re-

sults of investigations and experiments. 1,000 words. Municipal Journal and Public Works, May 31. 10 cts.

Septic Tank Patent Settlement. The National Septic Process Protective League accepted last month the offer of the Cameron Septic Tank Co., owner of the American patent, by the terms of which the League pays $5,000 to the company, for the release of each member of the league from claims of infringement, damage, etc. 800 words. Municipal Journal and Public Works, May 31. 10 cts.

Activated Sludge Without Compressed Air. Experiments at Sheffield, England, indicate possibilities of substituting mechanical stirring for use of compressed aid; aerated by surface absorption. 800 words. Municipal Journal and Public Works. May 17. 10 cts.

Mechanical Agitation for Activated Sludge. Editorial referring to experiments made in England demonstrating that applied air was not necessary. 200 words. Municipal Journal and Public Works, May 17. 10 cts.

Analyses:

Dissolved Oxygen as an Index of the Pollution of New York Harbor. Purpose of this article to show to what extent pollution of the main parts of harbor has progressed, as made manifest by determinations of dissolved oxygen. By Kenneth Allen, sanitary engr., Board of Estimate and Apportionment, N. Y. C. 1,000 words. Municipal and County Engineering, May. 25 cts.

Bacterial Count in Water and Sewage. Critical study of a generally used measure for sanitary phases of water supply and sewage disposal; mathematical interpretation of results; applying standard methods to special conditions. By M. F. Stein, designing engr., division of sanitary engrg., Cleveland, O. 2 ills., 3,200 words. Fire and Water Engineering, May 28. 15 cts.

Sanitation:

A Problem in Anopheles Elimination. Preventing breeding in shallow edges of pond by use of cofferdams and drains, and by filling in. 1 ill., 1,300 words. Municipal Journal and Public Works, May 17. 10 cts.

Mosquito Extermination as an Investment. Editorial referring to New Jerseys' successful effort to prevent and clean up breeding spots, and to article in this issue describing how one small local problem of this kind was solved. 500 words. Municipal Journal and Public Works, May 17. 10 cts.

Land Drainage Procedure in Iowa. Estimated that the state will have used enough drain tile within next 10 years to traverse the circumference of the earth five times; sizes range from 4 inches to 6 feet in diameter. By G. D. Hart, C.E., Bancroft, Ia. 4 ills., 1,500 words. Municipal and County Engineering, May. 25 cts.

WATER SUPPLY.

Purification:

Methods of Removing Crenothrix from Public Water Supplies—Chlorine Treatment is Successful. Life processes of crenothrix; iron removal by crenothrix growing in filters; chloramine experiments and treatment. Paper before the Indiana Sanitary and Water Supply Ass'n, by W. F. Montfort, consulting chemist, St. Louis, Mo. 3,200 words. Municipal and County Engineering, May. 25 cts.

Water-Softening Sludge Repumped Eliminates After-Reactions. Results of a large-scale experiment at Grand Rapids, Mich., told by W. A. Sperry, chemist in charge, in paper before the Illinois section of the American Waterworks Ass'n; experiment suggested by what is being done with the use of air and sludge in the treatment of sewage. 600 words. Engineering News-Record, May 15. 20 cts.

Old, Overworked Filter Plants a Serious Health Menace. Quoting letter from a correspondent describing obsolescent condition of a waterworks and water-purification plant in a Middle West town. 800 words. Engineering News-Record, May 22. 20 cts.

Testing Stations for Determining Critical Factors for Water Purification Plant Design. Descriptions of the testing stations at Whiting and Midland, Ind.; costs of water testing stations. Abstract of paper before the Illinois section of the American Waterworks Ass'n, by W. T. M'Clenahan and R. S. Rankin, ass't engrs., Pearse & Greeley, Chicago. 3,000 words. Engineering and Contracting, May 14. 15 cts.

Report on Detroit Waterworks. Filter plant operated for 12 months; demonstrates possibility of filtering Detroit's water at very high rate; as demonstration plant it educates public; plans for permanent plant. 3 ills., 3,800 words. Municipal Journal and Public Works, May 10. 10 cts.

Differentia of B. Coli. The two groups of the B. Coli group, of most importance to the water bacteriologist, briefly considered; varied conclusions of investigators; determining nature and source of pollution. By Everett Judson, ass't sanitary engr., U. S. Public Health Service, paper before Illinois section of American Waterworks Ass'n. 1,000 words. Fire and Water Engineering, May 7. 15 cts.

The Bacteriological Standards for Drinking Water Supplies in Interstate Commerce. Giving standard adopted by the Treasury Department, which was recommended by a commission of leading sanitarians and bacteriologists of wide experience. By E. Judson, ass't sanitary engr., U. S. Public Health Service, from paper before the Indiana Water Supply Ass'n. 1,500 words. Engineering and Contracting, May 14. 15 cts.

Operation of Louisville Filter Plant. Removal of bacteria and suspended matter, amount and cost of chemicals and total cost of purification; cleaning sedimentation reservoir; brass holding-down screens in filters removed. 1 ill., 1,500 words. Municipal Journal and Public Works, May 24. 10 cts.

Chlorine Treatment a Boon, Not a Menace. Editorial comment on an anonymous article in the March issue of "Conservation," the official publication of the Commission of Conservation, Ottawa, entitled "Chlorine Treatment Temporary Measure. Defects in the System Render it a Constant Danger to Public Health." 1,400 words. Canadian Engineer, May 8. 15 cts.

Pumping:

Electrically Driven Pumps. For small waterworks the unit driven by electricity is particularly adaptable; growing tendency to replace other forms of power with electricity; advantages of its use in small developments. By D. D. Ewing, prof. of electric railway engineering, Purdue University, Lafayette, Ind. 1,700 words. Fire and Water Engineering, May 28. 15 cts.

Graphical Records of Surge Pressures in Pipe Lines. Tests made to determine effect of varying air-chamber conditions and changing choke gate area. By Ralph Bennett, Los Angeles, Cal. 4 ills., 1,700 words. Engineering News-Record, May 29. 20 cts.

Emergency Pumping at Grinnell. Investigation of the cost to the Iowa city department through an appeal to the Iowa State Board of Conciliation; result was saving of $5,000 a year to city. By Wm. G. Raymond, dean, College of Applied Science, State University of Iowa. 1,800 words. Fire and Water Engineering, May 21. 15 cts.

Cost of Pumping Through Pipe Lines. With table cost of delivering water at uniform rates of flow through pipe lines. From paper before the Illinois section of the American Waterworks Ass'n, by G. C. Habermeyer, acting chief, Ill. State Water Survey. 1 table, 700 words. Engineering and Contracting, May 14. 15 cts.

Reservoirs and Dams:

Flat Slab Substituted for Groined Roof of Reservoir. Money saved in Dayton waterworks structure due to less concrete and excavation and simpler forms. By H. C. Wight, supt., Division of Water, Dayton, O. 3 ills., 1,000 words. Engineering News-Record, May 22. 20 cts.

Improving Providence Water Supply. A temporary dam and a regulating dam with spillway of horse-shoe shape; completion of new reservoir will permit the elimination of pumping. By J. R. Hess, Jr. 3 ills., 2,000 words. Municipal Journal and Public Works, May 17. 10 cts.

The High Service Reservoir of the St. Paul, Minn., Waterworks. Description of the design and construction of the work by the designing and constructing engineer in charge, W. N. Jones. 6 ills., 3,000 words. Municipal and County Engineering, May. 25 cts.

Circular Concrete Reservoirs at Leamington, Ont. Provide storage of one million imperial gallons, which will supply town for several days and complies with requirements of the fire underwriters; low unit stress in steel; walls entirely separate from floors. By E. M. Proctor, James Loudon & Hertzberg, Ltd., Toronto. 8 ills., 1,600 words. Canadian Engineer, May 8. 15 cts.

Sweetwater Dam Enlarged for the Third Time. Latest reconstruction adds to height, provides siphon spillways and enlarges weir spillways to take care of maximum flood; second time dam has been given more spillway capacity. By H. N. Savage, consulting engr., Sweetwater Co., San Diego, Cal. 6 ills., 3,800 words. Engineering News Record, May 15. 20 cts.

The Measurement of Snow. Description of snow sampler; water equivalent of accumulated snow. From "The Measurement of Rainfall and Snow" in March proceedings of New England Waterworks Ass'n. By Rob. E. Horton, consulting engr., Albany, N. Y. 5 ills., 1,500 words. Canadian Engineer, May 1. 15 cts.

Rainfall, Absorption and Run-Off on Small Rural Drainage Area. Study of heavy rain, total run-off with soil absorption and run-off for small plants; the hydraulic jump. By Ivan E. Houk, ass't engr., Miami Conservancy dist., Dayton, O. 1,500 words. Engineering News-Record, May 1. 20 cts.

Fire Protection Charges:

Metering Private Sprinkler Systems. Brief description and illustration of system of metering water service connection used for private sprinkler systems in Lancaster, Pa. 1 ill., 500 words. Municipal Journal and Public Works, May 24. 10 cts.

Proper Regulations Governing Private Fire Protection Water Service Lines. Special Fire Protection by Independent Plants; references to court decisions concerning private fire protection. Paper before the Indiana Sanitary and Water Supply Ass'n, by D. R. Gwinn, pres. & mgr. of the Terre Haute Waterworks Co., Terre Haute, Ind. 3,800 words. Municipal and County Engineering, May. 25 cts.

Diagrammatic Representation of Public Utility Commission Decisions on Fire Charges. Diagrams prepared by Chester & Fleming, consulting engineers, Pittsburgh, as a guide to show what portion of water charges should be allocated to fire service. 4 diagrams, 1 table, 400 words. Engineering and Contracting, May 14. 15 cts.

Water Supplies:

Future Public Water Supplies in Iowa. Descriptive rather than technical discussion of the subject. By Lafayette Higgins. 3,500 words. Engineering World, May 1. 15 cts. 1,600 words. Engineering and Contracting, May 14. 15 cts.

Moose Jaw, Sask., Waterworks. Proposed extension to the Saskatchewan River; 70 miles of pipe line; using 24-inch continuous wood stave pipe; 2,000,000 gallon reservoir; no filtration required. 900 words. Canadian Engineer, May 22. 15 cts.

Water Supply for Camp Las Casas. Porto Rico camp for the draft army of the U. S. island possession draws water supply from San Juan; stored in elevated wooden tanks, with bases of concrete; labor plentiful, but heavy machinery scarce. By C. B. Burdick, Alvord & Burdick, engrs. 3 ills., 1,000 words. Fire and Water Engineering, May 14. 15 cts.

Okmulgee's Water Supply and Sewerage. Increasing capacity and purity of water supply; constructing sewage treatment plant and reconstructing sewerage system. 2,200 words. Municipal Journal and Public Works, May 10. 10 cts.

Miscellaneous:

Large Capacity Well Installation and Operation. Tuning-up process with gravel insertion stabilizes yield; high overall efficiency obtained with six-stage pump. 3 ills., 1,300 words. Engineering News-Record, May 1. 20 cts.

Canal System Used Alternately to Irrigate and Drain. Low-lift pumps required for part of area, but much of it is served by gravity auxiliary canals. 2 ills., 1,300 words. Engineering News-Record, May 8. 20 cts.

Sinking a Concrete Pumping Station in a River. House consisting of concrete cylinder 30 feet in diameter is lowered while being built from frame controlled by ratchet wrenches tied together for simultaneous movement. By K. O. Guthrie, engrg. contractor, Schenectady, N. Y. 6 ills., 1,800 words. Engineering News-Record, May 22. 20 cts.

Arizona Has New Water Code. Main purpose the protection of vested and initiated rights to the use of water, of the interest of public in the water supplies, and encouragement for the highest possible development of such supplies. By G. E. P. Smith, prof. of irrigation engrg., University of Arizona, Tucson, Ariz. 700 words. Engineering News-Record, May 22. 20 cts.

LIGHTING AND POWER.

Street Lighting:

Street Lighting in Austin. E. C. Bartholomew, up to this year in charge of the Department of Water, Light & Power, stated in his report for 1918 that an underground conduit system had been completed costing $60,000 and requiring almost 2 years for construction. 700 words. Municipal Journal and Public Works, May. 10 cts.

McPherson's Electric Department. Extensive use of current for cooking; recent extensions to plant; financial statement. 600 words. Municipal Journal and Public Works. May 31. 10 cts.

The Lighting Plant of St. Charles, Ill. A financial as well as a physical success; receipts have increased from $16,891 in 1914 to $20,768 in 1918. 300 words. Municipal Journal and Public Works, May 3. 10 cts.

South Norwalk's New Street Lighting. Lights and fixtures designed for this installation, supported on ornamental poles that also carry wires of private companies and of the municipal fire and police telegraph. 2 ills., 1,700 words. Municipal Journal and Public Works, May 3. 10 cts.

Report of the National Electric Light Association Convention. Telegraphic report of proceedings of the 15 sessions of the Atlantic City convention; brief account of most successful gathering in the history of central-station industry. 3 ills., 17,000 words. Electrical Review, May 24. 30 cts.

National Electric Light Association Meets at Atlantic City. Subjects discussed at the general sessions included municipal ownership, conservation of power resources and lamp production; technical sessions took up questions of prime movers, oil switches, underground construction and overhead lines. 2,300 words. Electric Railway Journal, May 31. 15 cts. 11 ills., 6,000 words. Electrical Review, May 17. 30 cts.

Hydroelectric Power:

Hydroelectric Development on Wisconsin River at Stevens Point. Description of hydroelectric development; interesting instance where load was developed with the generating station; simplicity marks installation; interconnection of systems. By Wm. F. Snyder, electrical supt., Consolidated Water Power & Paper Co. 2,500 words. Electrical Review, May 31. 30 cts.

Water-Power Utilization Urged in Great Britain. Utilization urged by state development; quick policy to provide employment. By our British correspondent. 1,000 words. Electrical Review, May 3. 30 cts.

Features of Mammoth Waterwheel Generator. Method of construction employed on one of the 32,500-Kva. generators which are being built for the Niagara Falls Power Co.; conservation in design and highest possible efficiency characterize this unit. 4 ills., 2,000 words. Electrical World, May 31. 15 cts.

The New Pompton Lake Hydroelectric Plant. Typical example of small water power developed advantageously for lighting and power service in New Jersey. 2 ills., 300 words. Electrical Review, May 3. 30 cts.

Opportunities for and Data on Small Municipal Hydroelectric Plants. The field for municipal ownership; reclaiming abandoned water powers; equipment and power per capita and costs; transmission, distribution and operating costs; hints on water power investigation. By Wm. G. Fargo, of Fargo Engrg. Co., Jackson, Mich. 3 ills., 3,000 words. Municipal and County Engineering, May. 25 cts.

Russian Water-Power Possibilities at Dnieper River Rapids. Hydraulic and canalization project interrupted by war; four dams and power plants would give about 600,000 horsepower nominal. By V. V. Tchikoff, consulting civ. engr., Berkeley, Cal. 1 ill., 1,000 words. Engineering News-Record, May 29. 20 cts.

Big Chute Generating Station. In 1909 the Simcoe Railway and Power Co. commenced development on the Severn River; transmitted power at 22,000 volts to their substation at Midland and thence to the municipality of Midland at 2,300 volts. By W. L. Amos, ass't engr., Hydroelectric Power Comn. of Ontario. 4 ills., 2,000 words. Canadian Engineer, May 8. 15 cts.

Economical Section of Water Conduit for Power Development. Formula for the best slope and size of conduit is deduced, which takes into account the construction costs, value of power recovered, and rate of returns expected on expenditures made, as well as other physical conditions of the problem. From paper before American Society of Mechanical Engineers by C. T. Hutchinson, consulting engr., N. Y. 3 ills., 2,000 words. Engineering and Contracting, May 14. 15 cts.

Gas:

Domestic and Industrial Use of Natural Gas. The attorney for the Equitable Gas Company tells the Public Service Commission of Pennsylvania about conditions in Pittsburgh district. By John Gates, Jr., Pittsburgh, Pa. 2,200 words. Gas Age, May 1. 20 cts.

Utilization and Conservation of Natural Gas. Discussion by the vice-president of the U. S. Natural Gas Co. at a conference called by the Public Service Commission of Pennsylvania. By L. I. Graham, Oil City, Pa. 2,200 words. Gas Age, May 1. 20 cts.

New Coke Ovens at the Providence Gas Works. A beautifully designed and well equipped plant embodying the latest improvements in coke and oven installations for providing city supply. By E. H. Bauer, Providence, R. I. 12 ills., 1,200 words. May 1. 5 ills., 4,000 words. May 15. Gas Age. 20 cts.

Miscellaneous:

Principles of Boiler Water Treatment. Nature and origin of scale-forming material and means of removing scale-forming elements and scale already formed; economies effected by softening water. Notes from a bulletin issued by the U. S. Fuel Administration as a means of encouraging economy in use of fuel. 2,500 words. Engineering and Contracting, May 14. 15 cts.

Planning for Power. Importance in further industrial development; need for systematic and efficient power development; power investigation undertaken by the Geological Survey; possibilities for central-station service to the nation. By Geo. Otis Smith, director, U. S. Geological Survey. 5,000 words. Electrical Review, May 31. 30 cts.

Public Policy on the Pacific Coast. Report of Pacific Coast section of the National Electric Light Ass'n directs attention to interconnection, water-power wastes, labor rate and other issues; "possibilities are boundless." By J. A. Britton, Pacific Gas & Electric Co. 2 ills., 1,800 words. Electrical World, May 24. 15 cts.

Cost Comparison of Transformer Types. Rational method of proportioning dimensions of single-phase transformers to obtain minimum cost for material; comparison between five types of single-phase transformer designed from same specifications. By B. C. Dennison, department electrical engineering, Carnegie Institute of Technology. 3 ills., 3,300 words. Electrical World, May 31. 15 cts.

REFUSE DISPOSAL.

Garbage Utilization by the Army. Editorial discussion of the feasibility of garbage utilization with reference to Mr. Bamman's article last week and this on the effects of its use in army camps. 300 words. Municipal Journal and Public Works. May 3. 10 cts.

The Army's Utilization of Camp Wastes. New form of contract secures greater economy in the use of food, more material from which glycerine can be derived, and larger revenue; tabulated data from the various camps. By F. C. Bamman. 4 tables, 2,000 words. Municipal Journal and Public Works, May 3. 10 cts.

Hog Feeding in Spokane. Plan developed whereby garbage will be collected without cost to householders and fed to hogs. 350 words. Municipal Journal and Public Works, May 17. 10 cts.

The Columbus Reduction Plant. Operation affected by abnormal conditions due to war, the worst being the reduction in raw material. From report by the superintendent of the plant, Thos. D. Banks. 400 words. Municipal Journal and Public Works, May 24. 10 cts.

FIRE AND POLICE.

No Government Fire Apparatus to Be Sold. Statement from Director of Sales of War Department sets at rest rumors that used apparatus from abandoned government institutions were to be thrown upon market; only enough for its use after redistribution. 800 words. Fire and Water Engineering, May 14. 15 cts.

Send the Chief. The advantages to him and his department will far offset the amount spent by the municipality in doing this; comparison of new methods of fire control and new apparatus will alone repay the outlay. 1,000 words. Fire and Water Engineering, May 14. 15 cts.

The New York Fire Patrol. History and description of the organization; under direction of the New York Board of Fire Underwriters; duties do not conflict with those of the fire department. By J. O. Schwank, supt., N. Y., Fire Patrol and Fire Insurance Salvage Corps. 7 ills., 1,800 words. Fire and Water Engineering, May 7. 15 cts.

Ladders. Theory of stresses in beams and trusses applicable; ladders used for fire departments of the truss in majority of cases; practical construction; difference of opinion as to proper method of use. By R. T. Reddy, Alliance, O. 10 ills., 2,000 words. Fire and Water Engineering, May 21. 15 cts.

Air Patrolmen. May soon become a necessity for the safety of aviators and those below, and as aid to the fire department. 100 words. Municipal Journal and Public Works, May 3. 10 cts.

CITY PLANNING AND HOUSING.

City Planning:

Town Planning Institute of Canada. Giving the provisional constitution and by-laws of the institute, the inaugural meeting of which is to be held at an early date. 1,700 words. Canadian Engineer, May 15. 15 cts.

The Relation of Sunlight to Town Planning. Some well-known astronomical and other facts about the sun which should be considered in determining the direction and width of streets, height, orientation and density of buildings and similar matters. From paper before the Ottawa Branch of the Royal Astronomical Society by H. L. Seymour, engrg. ass't to the Dominion Housing Comn. and Town-Planning Advisor. 2,500 words. Engineering and Contracting, May 7. 15 cts.

Proposed Lake Front Improvement at Chicago. South Park Commissioners, the city, the Illinois Central Railroad Co. and the War Department, through the Chicago Railway Terminals Commission, are collaborating on the work; provisions in detail. Engineering World, May 15. 15 cts.

Maps:

Reference Maps More Accessible. Quarter section sheets of city map of Portland, Ore., numbered with reference to base line and meridian. By O. E. Stanley, sewer engr., Portland. 1 ill., 1,000 words. Engineering News-Record, May 8. 20 cts.

City Maps. Waltham, Mass., a city of 32,000 population, is provided with a number of maps of its area drawn to different scales for the several purposes. 300 words. Municipal Journal and Public Works, May 31. 10 cts.

Housing:

Aid the "Own-Your-Own Home" Campaign. Appeal made by the U. S. Department of Labor to various municipalities for aid of a kind which can be rendered only by official action. 250 words. Municipal Journal and Public Works, May 10. 10 cts.

Home Buying in Detroit. To aid its employes in acquiring homes the American Blower Co. has organized an advisory and financial service in its welfare department; motive is to help employes relieve the almost intolerable housing conditions in Detroit and to make its employes permanent. By J. H. Collins. 1,500 words. Municipal Journal and Public Works, May 31. 10 cts.

How One Contractor Went About a Housing Job. Building 450 small dwellings for shipyard workers in limited time required organization of forces and planning of operations in different manner from that of usual large-contract job. By Jos. Meltzer, of Jos. Meltzer & Co., Boston, Mass. 5 ills., 3,000 words. Engineering News-Record, May 29. 20 cts.

Meeting Housing Problem at Tacoma. The Todd Dry Dock & Construction Co. recently completed the building of 48 houses in Todd Heights section of the city. By W. A. Scott. 800 words. Engineering World, May 1. 15 cts.

MATERIALS AND CONSTRUCTION.

Concrete:

Portland Cement Production in 1918. U. S. Geological survey gives out advance statement of final figures on amount and value of cement production. 500 words. Good Roads, May 31. 10 cts.

Standard Precast Concrete Frames Make Up Flume Trestles. Section cast along line put together to carry conduit over gullies up to 180 feet long and 36 feet deep. 3 ills., 1,000 words. Engineering News-Record, May 15. 20 cts.

Frozen Concrete Thawed by Putting Warm Concrete on Surface. It is also found that chemical changes in setting concrete produced enough heat to prevent freezing. 600 words. Engineering News-Record, May 15. 20 cts.

Fundamentals in the Make-Up of a Concrete Mixture. 13 points offered by A. N. Talbot governing the physical conditions which affect concrete making. 1,200 words. Engineering News-Record, May 1. 20 cts.

Improving Concrete by Rodding. Tests show that strength is increased materially by continuous agitation of wet concrete with rods. By F. E. Giesecke, head of Division of Engrg., Bureau of Economic Geology and Technology, University of Texas, Austin. 2 ills., 1,000 words. Engineering News-Record, May 15. 20 cts. 1,000 words. Engineering and Contracting, May 21. 15 cts.

Reinforced Concrete Culverts Under Irrigation Canal. After many experiments engineers on Rio Grande project adopt cradle construction for drains in quicksand. By D. C. Willett, El Paso, Tex. 2 ills., 400 words. Engineering News-Record, May 8. 20 cts.

Concrete in Roads, Bridges and Culverts. Fine aggregate should be tested for organic impurities, gradation (sieve analysis), mortar strength and volume of silt or loam; field tests of fine aggregate; Deval abrasion test. Paper before Canadian Good Roads Congress by H. Eltinge Breed, consulting engr., N. Y. C. 1 ill., 3,000 words. Canadian Engineer, May 29. 15 cts.

Physical Properties of Mortars and Concretes. Review of work done by other investigators and description of experiments performed for the greater Winnipeg water district; use of chemicals to resist alkali action abandoned after trial on one of the district's structures. By H. M. Thompson, laboratory engr., Greater Winnipeg Water Dist. 18 ills., 6,000 words. Canadian Engineer, May 1. 15 cts.

Bulking Effect of Moisture in Sands. Varying percentages of moisture in sand aggregate an important factor in concrete making; wet sands weigh less than dry; suggested methods of overcoming irregularities due to moisture. By Capt. L. N. Edwards, supervising engr. of bridges, Toronto, Ont., referring to the article entitled "The Design of Concrete Mixtures" in the issue of April 23. 900 words. Engineering and Contracting, May 28. 15 cts.

Labor-Saving Equipment for Handling Concrete Materials. Description of charging bin developed by the R. D. Baker Co., Detroit; materials dumped directly into the bin and from there to a measuring device into the mixer hopper. Described by Mr. Baker in Concrete Highway Magazine, from which this abstract is taken. 1 ill., 900 words. Engineering and Contracting, May 7. 15 cts.

Testing Materials:

Organization of a Standard Municipal Testing Laboratory. Essential duties are to develop uniform standards, establish fair basis for purchasing materials, obtain proper qualities in materials, insure proper usage, reduce risk costs and aid in advancement of knowledge of materials. From Cornell Civil Engineer, by Ass't Engr. J. O. Preston, Rochester Bureau of Municipal Research, Inc. 2,500 words. Canadian Engineer, May 22. 15 cts.

Why Materials of Construction Should Be Tested Prior to Their Use. Quick and slow setting cement; deterioration during storage; injurious chemicals in sand; poor sand responsible for most concrete failures. By Emanuel Mavant, concrete expert with Milton Hersey Co., Ltd., Montreal and Winnipeg, Canada. 2,700 words. Municipal and County Engineering, May. 25 cts.

Road Material Testing in Texas. Large number of tests made by laboratory of University of Texas indicates great activity in road work. 400 words. Good Roads, May 24. 10 cts.

Bridges:

Pneumatic Caissons with Wooden Cylinders for Sinking Bridge Piers. Used in construction of piers for 3 bridges now being built under the plans of Harrington, Howard & Ash, of Kansas City, Mo. 3 ills., 1,100 words. Engineering and Contracting, May 28. 15 cts.

Cost of Concrete Bridges. Figures sent through courtesy of W. E. Emery, superintendent of highways of Peoria County, Ill. 200 words. Municipal Journal and Public Works, May 17. 10 cts.

An Unusual Concrete Highway Bridge. Built near Greenup, Ky., having total length of 200 feet; consists of 8 spans, supported by open bents varying in height from 29 to 35 feet; each span has 4 girders connected by 8-inch floor slab combined in T-beam construction. By C. S. Bennett. 1 ill., 800 words. Municipal Journal and Public Works, May 24. 10 cts.

Cost-Plus-Fee Contract for Bridge Construction. Excellent competition under cost-plus-fee form obtained recently at a bridge letting in Kansas City, Mo. From "Engineering and Contracting." 2,300 words. Canadian Engineer, May 8. 15 cts.

Reinforcement of Bridge by Means of an Eccentric Chord. Floor span over railway weakened by corrosion; war conditions delay renewal; erection conditions necessitate placing new chord above floor; panels offset to balance eccentricity. 4 ills., 1,600 words. Engineering News-Record, May 8. 20 cts.

Put New Chords on Drawbridge Carrying Traffic. Engineer plans work to avoid closing of busy street; bridge swings free of end supports while riveting is done. 1 ill., 500 words. Engineering News-Record, May 15. 20 cts.

Recommended Procedure in the Painting and Maintenance of Highway Bridges. Classification of structures according to conditions; strengthening and repairing old bridges. By Chas. D. Snead, bridge engr., Kentucky Dept. of Public Roads, Frankfort, Ky. 1,400 words. Municipal and County Engineering, May. 25 cts.

Raising Allegheny River Bridge 13 Feet by Jacking. Without interruption of traffic under-clearance of four-track two-level steel structure at Pittsburgh is increased 12.6 feet. 10 ills., 3,200 words. Engineering News-Record, May 1. 20 cts.

Design of New Superstructure of Louisville Bridge with 644-Foot Riveted Span. Historic bridge one mile long replaced by double-track spans on same masonry piers; details of design and of deck trusses and lift span. 6 ills., 4,000 words. Engineering News-Record, May 22. 20 cts.

Maintaining Traffic During Erection of Louisville Bridge. Floods and washouts caused by swift current of Ohio River force revision of methods; timber towers support longitudinal steel girders. 7 ills., 2,100 words. Engineering News-Record, May 29. 20 cts.

TRAFFIC AND TRANSPORTATION.

Street Railways:

Plain Words on Transportation Service. Concrete suggestions are made on ways in which the service can be improved in schedule making, lay-overs, traffic supervision, assignment of runs and other ways. By A. Jackson, supt. of timetables, Public Service Railway, Newark, N. J. 2,600 words. Electric Railway Journal, May 31. 15 cts.

Municipal Railway System of San Francisco. Letter from M. M. O'Shaughnessy, city engineer of San Francisco, protesting against an editorial which appeared in the Feb. 19 issue of Engineering and Contracting entitled "San Francisco's Municipal Railway Is No Gold Mine." 500 words. Engineering and Contracting, May 21. 15 cts.

The Zone Fare in Practice. Dublin's housing problem arose from activities of house jobbers in old wealthy sections and from immigration of laborers to city from country because of high wages; tramway company has built 220 houses for employes. By Walter Jackson. 10 ills., 5,000 words. Electric Railway Journal, May 31. 15 cts.

Street Car Loop Subway Proposed by Pittsburgh. $6,000,000 municipal project to relieve downtown traffic congestion advocated by city authorities. 1 ill., 700 words. Engineering News-Record, May 29. 20 cts.

Motor Trucks:

The Field for Industrial Electric Trucks and Tractors. Tremendous possibilities of this equipment but little known; some features of the apparatus; need for central-station co-operation. 7 ills., 4,700 words. Electrical Review, May 17. 30 cts.

Tractors Reduce Service Cost at Machinery Plant. Dispatcher system with truck trains on paved roadways handles more material with fewer men than old teams. 3 ills., 800 words. Engineering News-Record, May 8. 20 cts.

How the Problem of Motor Transportation Will Be Solved. By good roads engineers and motor truck engineers working in co-operation to achieve the desired end. By R. E. Fulton, vice-pres., International Motor Co. 1 ill., 1,800 words. Good Roads, May 17. 10 cts.

Comparison of Short-Haul Truck and Rail Shipments. Trucks reported to be efficient for 125-mile hauls; freight delays, extra boxing, clerical work prove expensive items. 1,200 words. Engineering News-Record, May 8. 20 cts.

Motor Truck Haulage Saves About $1,000 per Mile in Gravel Road Construction. Saving of $6,000 effected in this way by Itasca County, Minn., on Grand Rapids-Duluth Highway. 1 ill., 600 words. Engineering and Contracting, May 7. 15 cts.

(To be continued next week.)

USE OF CHLORINE FOR MUNICIPAL WATER SUPPLIES—(Continued from page 439).

City and State	Population 1910	Population 1918	Began use of chlorine	Use discontinued	Other treatment	Deaths from Typhoid — Years Before Use of Chlorine 5	4	3	2	1	Years After Use of Chlorine 1	2	3	4	5
Vermont:															
Rutland	13,546	15,500	1910	No	None	4	2	0	0	2	1	1	1	1	5
Virginia:															
Martinsville	3,000	5,000	1916	No	Filtration	..	..	..	..	..	..	..	..	..	..
Newport News	22,500	75,000	1918	No	Filtration	..	..	..	4	3	..	..	..	..	..
Washington:															
Seattle	240,872	400,000	1915	No	None	33	24	20	14	19	10	18	9	..	..
West Virginia:															
**Elkins	5,500	7,000	1916	No	None	..	..	15	11	11	11	16	..	..	..
Wisconsin:															
Kenosha	22,000	36,000	1913	No	Filtration	..	13	5	11	8	6	1	2	5	2

*The corresponding deaths, deducting imported cases and t hose without city water on the premises, were 0, 5, 4, 3, 2, 2, 1, 3. †All figures for deaths for Michigan cities are in rates per 100,000 of population. §Reduction in rate for this and the two following years was due to elimination of outside privies. ‡Typ hoid figures are death rates per 100,000. The entero-colitis rates for the same years were 412, 321, 207, 220, 80, 74, 61, 166. **Figures of deaths are for the entire county; those for the city are not kept separate. ††Due to milk epidemics. §§For one of eight sources of supplies in 1914; extended to all the others for over a year.

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI New York, June 21, 1919 No. 25

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Editorial Notes 445
The Water Works Convention—Municipal Ownership of Water Works.

American Water Works Convention 446
Full account of the business transacted, papers read and discussions of these and of other matters, at the thirty-ninth annual convention of the American Water Works Association.

Private Fire Protection 449
Abstract of the exhaustive report of the committee of the A. W. W. A., which elicited considerable discussion at the convention, which discussion is given in the account of the convention.

The War and the Water Works 451
Discussion of figures and conditions showing the effect of the war period and of public control upon the water works of the United States. By **Leonard Metcalf.**

San Francisco's High Pressure Service (Illustrated) 454
This fire service was originally kept as a reserve, the regular water supply being used for fire fighting; but it is now used as the main reliance for this purpose.

The Week's News 456

News of the Societies 459

Problems Cities Are Studying With Experts 459

New Appliances (Illustrated) 460

Industrial News 461

Municipal Index 462

Contract News 19

THE WATER WORKS CONVENTION.

To its thirteen hundred members the annual convention of the American Water Works Association is a most important event, as the opportunity of the year for meeting with others whose ideas and problems are the same, for keeping up to date in their knowledge of the progress made in the water works field, and for receiving new inspiration for high-grade professional work.

But many are unable to attend every convention. At last week's convention only about twenty per cent of the active members were in attendance. The other eighty per cent must obtain their share of the benefit through reading accounts of the proceedings, the papers and discussions. This is far less profitable than first-hand acquiring of the information, while the benefit of personal contact is missing; but it is much better than nothing. For the benefit of the absent eighty per cent (and of the many more who are not members) we are publishing this week (to be concluded next) a description of the meetings of the convention which we believe will be found to give as complete knowledge of what was said and done as could be conveyed by anything less than the full minutes of the convention. Owing to its importance to all water works men we offer no apologies for the space in this issue devoted to it.

MUNICIPAL OWNERSHIP OF WATER WORKS.

"Public ownership is less attractive to the people in the light of recent experience in public administration of public utilities in construction work—of the Shipping Board, the Housing Bureau, the Railroads, the construction and other divisions of the army at home and abroad—and of the advance in prices of labor and materials. The condition and service of the railroads and of the electric traction properties are far from satisfactory and their present financial problems seem almost insolvable. Many of the great water works systems are in difficult positions financially. The Government itself, as evidenced by the utterances of Mr. McAdoo, Mr. Hines, and many others, has recognized the decline in morale under Government ownership. The attitude of the great daily papers the country over, in text and editorials, appears overwhelmingly opposed to its extension. Even the utterances of the Church, through Cardinal Gibbons, reflect the same view."

Such is the opinion of one of the most prominent engineers of the country, who is accustomed to taking broad views of questions in which public utilities are involved, and not the strictly engineering side alone. And this opinion was expressed in a paper before the national water works association, in spite of the fact that no

other public utilities have been owned and operated more generally or more successfully by municipalities than have water works.

Whether an opinion adverse to municipal ownership of water works should be deduced from federal ownership of entirely different types of utilities during the unusual conditions of the past two years is open to debate and will, we believe, be answered in the negative by many officials of municipal water works plants. It is quite possible, however, that experiences of the past two years will, as Mr. Metcalf suggests, prejudice taxpayers generally against all municipal ownership of any kind of utility, in spite of the long and favorable showing made by municipally-owned water works.

AMERICAN WATER WORKS CONVENTION

Doings of the Thirty-ninth Convention of the American Water Works Association—Business Transacted, Reports of Committees, Papers and Discussions, and "Round Table" and "Question Box" Exchanges of Experiences.

The 39th annual convention of the American Waterworks Association was held in Buffalo last week, the first session being held on the morning of June 10th, and the last on the morning of Friday, June 13th. However, the latter was an informal session, all business of the association being terminated with the morning session of Thursday, June 12th. The final list of members registered showed 278 active members present, 201 associate members and a considerable number of guests.

The number of papers read was smaller than usual, but this was more than compensated by the exceptional character of most of them, and by the amount of general discussion that took place at most of the sessions. There was little important business transacted at the convention other than the regular nominating of members of the nominating committee, announcement of the result of the letter ballot for the election of officers, and selection of the next place of meeting. The officers elected for the following year were: President, Carleton E. Davis, chief of the Bureau of Water, of Philadelphia; vice president, M. L. Worrell, general manager of the water department of Meridian, Miss.; treasurer, James M. Caird, (re-elected); and trustees, W. H. Randall, superintendent of maintenance of the Toronto waterworks, and F. C. Jordan, secretary of the Indianapolis Water Company. Montreal was selected as the place for the next annual convention, (possibly because personal liberty there will not be affected by the prohibition amendment). The nominees for the Nominating Committee selected by the several districts were as follows: District No. 1, Frank A. Barbour and James H. Long; district No. 2, Lyman P. Hapgood; district No. 3, George C. Gensheimer; district No. 4, Henry B. Morgan and C. W. Wiles; district No. 5, Chester E. McFarland and F. T. Cutts; district No. 6, J. Chris Jensen and F. W. Cappelen.

AMENDMENTS TO THE CONSTITUTION.

On the recommendation of the executive committee, two amendments to the constitution were adopted, one amending section 3, article X, of the constitution so as to insure that officers of the several sections be limited to strictly active members, the section as revised read-in: "Such sections which shall consist only of members of this association in good standing, shall elect their own officers and committees, subject to confirmation by the secretary of the association as to their standing in the association; and may make any rules for their government not inconsistent with the constitution and by-laws of the association, but these rules must first be approved by the executive committee."

The other amendment was an addition to section 1, and article V, as follows: "Provided that any active member in good standing who has paid dues continuously for thirty years shall be exempt from payment of further dues." It was explained that the latter amendment would at present apply to twenty-seven members.

In addition to proposing these amendments, the executive committee announced that the remission of dues of members in war service will be continued until demobilization is effected; and that all members who may be in arrears of dues on July 1st of each year be notified that their names will be taken off the mailing list of the Journal until such time as their dues are paid up.

MEMBERSHIP.

The secretary, in his annual report, stated that during the year ending April 1st 72 active members had been elected, and 12 had been restored by paying back dues, while 47 had resigned, 13 died, 65 had been dropped for non-payment of dues, one had been dropped because an enemy alien, and three had been transferred to corporate membership; giving a net loss for the year of 45. Corporate members had been increased by six elected, two restored by paying back dues, and three transferred from active membership, there being a net gain of nine during the year. Eight associate members were elected and nine were lost, a net loss of one. Two honorary members died during the year, leaving five. This gives a total membership as of April 1, 1919, of 1,241, a net loss of 39 from the year previous. Concerning this membership report, Secretary Diven announced that the loss was probably due to war conditions, and that since the first of April, the society had received about 70 applications for membership and had had about 11 resignations, giving a net gain during the past few weeks of 59, which would more than offset the loss for the year.

In connection with his report as chairman of the membership committee, Lewis I. Birdsall stated that the committee believed it would be desirable to establish a great number of new sections in order to reach water works men in the smaller cities who feel it impossible to attend national conventions, but who would probably come out to section meetings if sufficient number of these were scattered throughout the country. He stated that the American Chemical Society had a membership of 15,000 which is made up of local members in every state.

A number of other resolutions were adopted by the society in connection with reports of committees, which will be referred to in the description of the convention, which follows.

Tuesday Morning Session.

President Charles R. Henderson opened the convention in the convention hall of the Hotel Iroquois, at 9.30 Tuesday morning, with 155 members present. Following the address of welcome by A. W. Kreinheder, commissioner of public works of Buffalo, and a reply by President Henderson, the business of the convention opened with the report of the canvassing committee on the election of officers, which has already been given. In a brief speech, president-elect Davis called attention to the fact that, by the method of voting for officials now

employed by the society, the cost of this election was something over $500, or nearly $1.50 for each vote cast.

EFFECT OF THE WAR.

One of the most important papers of the convention, and one calling forth a large amount of discussion was then read by Leonard Metcalf, entitled "The Effect of the War Period, 1914-1918, and Public Control Upon the Waterworks of the United States." This paper will be found elsewhere in this issue, except that the tables and diagrams with explanatory notes will be postponed until next week for lack of room. Lieut. Col. Dabney H. Maury expressed what was apparently a general opinion in saying that the facts brought out in this paper were of the greatest immediate importance to members of the association, and that it was desirable that copies of the paper be placed in their hands as soon as possible. The motion was carried that it be printed in pamphlet form and sent out as soon as possible. At a later session, however, this decision was reversed, in view of the expense, and the fact that the paper would be published in regular order in about two months. (Readers of Municipal Journal and Public Works, however, will be able to benefit by the paper at once.) In answer to a question, Mr. Metcalf stated that he believed that the figures of the plants given in the table were fairly characteristic of all plants throughout the country.

Increasing Rates. There was a discussion among the members of conditions throughout the country as to the raising of rates and the action of public utility commissions in permitting such increase. (Next week or the week following, we expect to publish data furnished by several hundred waterworks superintendents, stating whether and to what extent they have raised rates since before the war.) J. N. Chester stated that in Ohio the Public Service Commission has no jurisdiction where there is a contract between private companies and manufacturers, and that, therefore, in that state and under those conditions, private companies could not raise their rates. He also stated that the political situation may affect the success of an application for permission to increase rates in that, if the legislature is about to convene, and there are a number of bills under consideration whereby the functions of the commission may be changed, a rate increase is likely to be denied, whereas if the legislature has just adjourned, the prospect of increase is much better.

R. B. Howell, of Omaha, told of the unusual conditions in their plant by which the rates were reduced seven per cent. in 1917, and by an additional five per cent. on January 1, 1919. The municipality had taken over the plant in 1912, and the rate to 97 per cent. of the consumers had been reduced to 50 per cent. by 1918, in spite of which the plant had accumulated a reserve of $400,000. However, the increase in expense due to increased costs had amounted to about 30 per cent. and would have been larger but for improvements which they had made, one being the manufacture of its own filter alum, at a cost of sixty cents per hundred pounds, including interest on the plant and depreciation and cost of operation, whereas they had been asked to pay $1.27 in 1916 for a three-year contract. As the plant used about fifty cars a year, this alone saves them about $15,000 a year. Another saving is effected by providing pits in which they can store under water from 12,000 to 15,000 tons of coal, or about 60 per cent. of a year's supply. They are thus enabled to buy coal in any quantity and take advantage of low prices at any time. They have purchased about $470,000 worth of Liberty bonds.

Future Costs. J. W. Ledoux said he was particularly interested in Mr. Metcalf's prediction that wages would not be lowered, and might go higher, and thought that making such prediction was of doubtful expediency, especially since it could not be made with any certainty. N. S. Hill agreed with Mr. Ledoux, believing that the price of labor will stay substantially where it is, but that we should be extremely conservative both in predicting and in acting upon such beliefs. The prices of materials, he thought, would be reduced materially, but slowly, but urged that such belief be not used as an argument for deferring new construction. Especially should new construction be put through at once if it is necessary to maintain service, since he believed that the public wanted good service, and would much rather pay a little more for it than have its quality deteriorate. The charge for water cuts very little figure in the living economies of any person, and it is not likely to be considered in comparison with efficient service. From the municipal plant view-point, it is policy to give good service, and from the private plant viewpoint there is nothing in the world that maintains rates so well.

Municipal Ownership. Discussing the matter of municipal ownership, Mr. Howell said that one of its chief advantages is the lower interest rates and absence of profit that had to be provided. The electric light plant in Omaha, a short time ago, was found to be paying 11 per cent. on its investment, while the municipal waterworks plant was paying an interest of 4.4 per cent. on the capital invested in its plant. If the difference, or 6.6 per cent. be put in a savings bank each year at 4 per cent., at the end of thirty years, when the bonds are due, they would be able to pay off all the bonded indebtedness of the city of Omaha, Douglas county, in which it is located, the school district, and still have 23 million in the treasury. "Public ownership can win if it can have fair and just management; but when public ownership gives up all revenue from fire protection, and does not have fair return from everybody who receives service, that is where it fails." Omaha charges for all service rendered—fire hydrants and sprinklers, public fire protection, etc. Where mains are laid in a newly developed property, the owners of the property must pay for them at the rate of fifty cents a front foot on each side of the street.

DAMAGES TO FIRE HYDRANTS.

There was then a general discussion, called a "round table meeting" on the subject of "Damages to Fire Hydrants by Motor Vehicles and Remedies Therefor." The discussion was opened by Wm. W. Brush, deputy chief engineer of the New York Department of Water Supply, Gas and Electricity, who stated that during the past two years that city had had an average of about 400 hydrants a year destroyed by motor trucks, generally the larger three or five-ton trucks. This involves an annual expenditure of about $12,000 for repairs. At first they replaced the hydrants or scrapped the damaged parts, but for some time now they have been repairing the breaks by welding by the oxyacetylene process. Broken standpipes are welded in the municipal shop for about $6.00 each, including the entire labor and material cost, but not any overhead charges. To take out the standpipe, weld the break, and reassemble the hydrant, costs about $12.50. Welding done outside the shop would cost about $8 or $10. Other items, including cost of removing the hydrant and replacing the repaired one bring the total up to $20 or $25.

Mr. Brush concluded that, although the cost of making repairs was considerable, it would not pay to make any change in either type or location of hydrant in order to avoid it, since there are more than 40,000 hydrants to be changed, which would allow only 30 cents each. Even

if confined to the boroughs of Manhattan and the Bronx alone, where the traffic is heaviest, there are about 21,000 hydrants and the cost would be less than 60 cents per hydrant a year, which would not cover the cost of change in location or type.

In New York, with the breaking of the hydrant, the loss of water is negligible, the standpipe being broken at or above the surface and the valves of the pressure hydrants remaining closed. In some cities where hydrants are used that open with a little pressure, the breaking of hydrants has resulted in very serious troubles. Mr. Brush said that he had been told by Mr. McInnes that Boston recently changed its type of hydrants on account of the damage that followed the opening of hydrants by pressure. Mr. Brush said that it did not seem that any practicable thickness of the wall of the hydrant would lessen the number of damaged hydrants, but any hydrant would break when a heavy truck hit it. He also doubted whether any fenders or guards could be used that would effectively protect hydrants.

C. W. Wiles, of Delaware, Ohio, said that his city had found that it was cheaper to buy a new barrel and renew interchangeable parts than to weld. Mr. Brush, on the subject of cost, supplemented his figures by stating that the cost of removing a hydrant that did not have a flange at the ground surface would comprise $5.00 for caulker, $6.50 for two laborers, $3.00 for a Ford car and $4.80 for replacing 16 square feet of sidewalk; the greatest part of which cost would be elminated if a hydrant is used that has a flange at the sidewalk level.

Remedies Available. F. W. Cappelen, of Minneapolis, began a discussion of the other phase of the subject—the remedies available or methods of prevention possible. The records of his city show that only one hydrant has been broken that was not located at a street intersection and he therefore suggested that most of the breakage could be avoided by placing hydrants at the middle of the block rather than at the corner, or at least back a little distance from the corner. He had found that certain corners seemed exceptionally fatal to hydrants, there being several where hydrants were broken one after another, and other members reported having had the same experience in their cities.

Considering the four remedies that had been suggested —moving hydrants from the curb to the building line, substitution of flush hydrants for the post style, placing post fenders around hydrants, and repairing broken hydrants, Mr. Cappelen did not consider it good practice to set hydrants near buildings because of the inaccessibility of the hydrant should the building be on fire; the area-ways under the sidewalks in the business district would prevent this location, and hydrants so placed would be inaccessible to fire engines.

Flush hydrants might be practicable in warm climates, but it would be difficult to find them quickly under snow and ice; frozen covers would delay their use, and the inconvenience of connecting to them would make them unpopular with fire departments. Also the pit in which the hydrant is placed fills with water and slush and freezes solid in case of a winter fire of several hours' duration. Minneapolis had had about twenty-four such hydrants, but these had been replaced by post hydrants for the reasons stated. Moreover, the expense of changing to flush hydrants would be enormous, and if only part were changed there would result a confusion that might be serious in an emergency.

As to hydrant guards, Minneapolis had had hydrants broken off where six-inch pipes had been set in the ground to protect them. Guards or fenders which were effective would have to be so substantial as to be undesirable obstructions not only to traffic, but also to the firemen's use of the hydrants. They would also involve considerable expense.

In Minneapolis 43 hydrants had been broken during the past sixteen months and repaired at a cost of $14.40 for excavation, removal and resetting, $3.84 for shop work and assembling, $10.47 for welding by private parties, and $2.50 for cartage; a total cost of $31.21 average per hydrant. A hydrant without a jacket set in the ground will resist a considerable blow and in some cases a seven-inch post will be pushed over somewhat without breaking. He therefore suggests using hydrants with a large, strong barrel or post set firmly in the ground. Mr. Cappelen seemed, however, to favor chiefly the locating of hydrants a lot or two away from the intersection of the street lines, since the greater danger appeared to be at the corners, and such location of hydrants would still permit running hose lines from them down either street.

Mr. Brush, commenting on this, said that he did not know whether or not damages to hydrants in New York City had been altogether to corner ones. The present practice in New York is to set hydrants fifty feet away from the corner, which he believed lessened the danger from breakage by trucks. Richard Whitney, of Syracuse, reported that hydrant breakage had not occurred often enough in that city to be considered a serious problem, being considerably less than ten a year out of 4,000 hydrants. One particular hydrant has been broken three times in two years, being at the intersection of a wide and a narrow street, where a great volume of traffic turns from the wide to the narrow. All but two of the breakages, so far as they know, were caused by pleasure cars. One was caused by a truck driver who, when ascending a steep hill, found that the brakes would not hold nor the power carry him to the top and deliberately backed the truck into the hydrant to stop his downward progress. It is the intention in Syracuse in the future to study traffic conditions in placing new hydrants and to use for critical points a type of hydrant which has the least tendency to open when broken.

A. W. Cuddeback, of Paterson, N. J., said that the percentage of breakage there was about the same as in Brooklyn and about 50 per cent of the compression hydrants break off down near the valve. Mr. Chester did not believe that electric welding would be practicable for small communities where the number of broken hydrants in a year are few, warning officials of such cities to make careful calculation before deciding that welding would be cheaper than buying repair pipes. On the other hand, W. S. Cramer stated that in his town of 4,000 inhabitants 12 hydrants were broken last year and were repaired by the oxyacetylene process in a local machine shop at an average cost of $6.56 a piece.

Replying to a question as to whether the city paid for damages due to flooding by broken hydrants, Mr. Brush said that in New York State the party suffering the damage could not collect from the municipality provided the municipality has exercised promptness in shutting off the water from the broken part of the distribution system.

President Henderson asked the superintendents to indicate by a show of hands whether they made a general practice of setting a valve on the hydrant branch, the result being that most of them appeared to set valves in this way, and Mr. Wiles said that modern practice had demonstrated that every hydrant ought to have a shut-off valve, and he believed that all up-to-date plants were now using them for each hydrant.

Tuesday Afternoon Session.

The session opened with a short paper by John Knickerbocker entitled "Investigation of Question of Flanges for Light Cast-Iron Pipe," the purpose of the paper being to place before the society drawings and other information showing thickness of flange, diameter and spacing of bolt holes according to standards of the Am. Soc. of Mechanical Engineers and others, and to recommend an effort to obtain one common standard. The matter was referred to the standing committee on Revision of Standard Specifications for Cast-Iron Pipe and Specials.

The report of the committee on Private Fire Protection Services was then taken up and discussed at considerable length, the convention voting that "the committee be continued, with instructions to more thoroughly crystallize, from the discussion, its recommendations and again bring them before the association for adoption, either by letter ballot or at the next convention." The report has already been printed in a pamphlet of 58 pages and distributed to tht members.

(To be continued)

PRIVATE FIRE PROTECTION.

Report of Committee of American Water Works Association Giving Recommendations for Procedure in Installing and Charging for Private Fire Devices.

The committee on private fire protection service of the American Water Works Association consisted of Nicholas S. Hill, Jr., chairman, George G. Earl, Frank C. Jordan, Walter E. Miller and Maj. E. V. French. Owing to the absence of Maj. French in Europe he was not able to act with the others in the preparation of their report which was submitted to the convention on June 10. A very much condensed abstract of this report is given herewith, in which only the conclusions are presented, it being impracticable for us to give space for the various arguments pro and con in connection therewith.

The committee divided the more important questions under two heads, physical and fiscal, as follows:

A. *Physical*:

1. Shall water for domestic and manufacturing uses be furnished through the same service pipe with water for private fire protection equipment?

2. How shall the water purveyor be protected so as to prevent the intentional or unintentional use or waste of water through such connections?

3. How shall private fire service pipes be controlled where they enter buildings or private property so that in case of the breaking of the inside pipe, or of the service pipe, water may be shut off and bleeding of the water system prevented?

4. What limit should be placed upon the size of fire service connections?

5. What means shall be adopted to prevent the pollution of a public water supply through a private fire protection service when an independent water system is also connected with the fire protection system?

B. *Fiscal*:

6. By whom should the cost of installing the private fire protection service and accessories be borne?

7. Should a charge be made for private fire protection service?

8. How should the charge for private fire protection service be determined?

The following includes the more important elements of an ordinary private fire service equipment.

a. Automatic sprinklers.

b. Open sprinklers turned on by hand for the outside protection of cornices and windows.

c. Standpipes for hose in buildings.

d. Yard hydrants.

e. Connections for filling cisterns or tanks from which fire pumps draw, or direct connections to the suction connections to fire pumps.

f. Elevated tanks for the storage of a supply of water to be used for fire protection purposes only.

Answering question No. 1, the committee concludes that in general it is advisable to install separate fire service connections for all mills, factories, industrial plants, railroad terminals and the like and to insist upon separate connections for all classes of property unless it is feasible to install a meter which is as accurate as one designed for the registration of domestic or commercial consumption. It is inadvisable in any case to allow the combined use of a single service connection, when protected by fire service meters only or by other methods which are practical on service connections used for fire service alone. In no case should combined service connections be allowed for premises supplies from an independent water supply for fire protection.

Second Question.—Discussing question No. 2, the committee states that out of 521 replies to inquiries as to whether the different purveyors had discovered a loss of water through private fire connections, either through leaks or use of water, 236 testified to actual experience of the intentional and unintentional use or waste of water through unmetered fire connections.

As the installation of a meter adds nothing to the value of a service from the consumer's viewpoint, but adds to its cost, individuals, corporations and the underwriters have opposed the use of meters. Many of the ordinary types of domestic and commercial meters are objected to by the underwriters on the ground that the moving parts may become clogged and obstruct the flow of water. Some of the ordinary types of domestic and commercial meters create large friction losses when delivering the quantities necessary for fire protection service. Fish traps are also objected to because they may become clogged. Service meters designed especially for fire service connections have been developed which eliminate in large measure the objection raised to the ordinary domestic and commercial type of meter. Among such may be mentioned the Hersey Detector Meter sold by the Hersey Manufacturing Company, the Trident Protectus meter, manufactured by the Neptune Meter Company, and the Utility Meter furnished by the Pittsburgh Meter Company. These meters differ chiefly in details. In principle they are the same. They consist of a check valve in the main supply line, arranged with a by-pass on which a meter is installed to measure accurately all water passing through the by-pass around the check, together with another meter which measures the quantity of water which passes through the check valve when the valve is open.

Although these meters practically eliminate the danger of obstructing the flow, the underwriters have insisted upon the introduction of a by-pass around such meters so that water for fire service may be obtained when the meter is being examined, adjusted or repaired. The valve on the by-pass is sealed so that water may not be used ostensibly through the by-pass unless the seal is broken; but the installation of this by-pass results in the practical elimination of the security to be obtained from the installation of the meter as a preventative against the intentional use of water through private fire service connections in the absence of systematic and regular inspections. The committee sees no good reason for requiring such by-pass.

The committee is convinced that the great majority of waterworks superintendents favor such meters, but offers for consideration, where separate fire connections for fire protection only are installed, what it has termed the "bond-alarm-inspection system." Even when a meter is used, the device must be inspected at regular intervals, and the committee suggests that the applicant file a bond with the water purveyor conditioned upon the use of the fire service connection for fire protection only, to be forfeited in the event of violation of the rules; the amount of bond to be sufficient to deter the water-taker from running any risk in the matter. Instead of a detector meter, install an alarm valve equipped with a pressure recording the gauge and a small by-pass meter, such valve being a check-valve arranged with a clapper which, when raised a slight distance from its seat, opens a port by which an electric circuit is closed and an alarm bell rung. Usually the discharging of one sprinkler head is sufficient to open the port. An eight-day recording pressure gauge is connected with the port and arranged to register simultaneously with the ringing of the gong. The inspector of the water department would, during his weekly inspection, observe if and when check valve had opened during the previous week. A small ⅝-inch meter would be installed on a by-pass around the alarm valve to register small flows of less than twenty gallons per minute, which is sufficient to open the port. In addition, all yard hydrants, valves on hose outlets, on standpipes and other outlets connected with the sprinkler system, would be sealed and the seals inspected monthly. The alarm performs the important function of summoning help in case the sprinklers begin discharging at night or in places where no employes are present. The committee believes that either this system or a meter should be placed on all fire service connections.

Third Question.—The record of 20,000 or more fires indicates that in about five per cent of them automatic sprinklers do not hold the fire in check sufficiently to enable the blaze to be extinguished by outside fire-fighting agencies. If the sprinkler system fails, bleeding of water mains due to broken fire service connections or broken sprinkler equipment within buildings may result, causing enormous losses of water.

Where the building is located at a sufficient distance from the street, it is possible to provide adequate protection by installing a valve with indicator post at the building line or curb line. Where the building is close to the street, it may be necessary to place such valve across the street from the building and loop the service line across the street and back. It should be remembered, however, that during a large fire the heat may prevent access to the valve unless its distance from the burning building is considerable. It is always advisable as an additional precaution, where streets are narrow, to gate the street mains so that no more than a block, or a maximum of 500 feet, of mains need be shut in case the control valve be inaccessible.

The committee recommends the installation of valve with indicator post at the curb line where the buildings are some distance away, the looping across the street as suggested above where the building is close to the street and, in congested districts, securing the best possible location for such valve and in addition locating gates in the mains convenient for cutting out the main leading to the property.

Question No. 4.—The great majority of fires are controlled by the opening of not more than ten sprinkler heads, but there are many where fifty have opened; while in some the number which have opened is appreciably in excess of this. The discharge per sprinkler head is given by the committee as varying from twelve gallons per minute when the pressure on the head is five pounds, to fifty-eight gallons per minute when the pressure is one hundred pounds. The amount needed, however, cannot be measured definitely by the number of sprinklers to be supplied. More water will be needed in a plant having large undivided areas than in one which is more closely subdivided. In general it may be said that for small plants 500 to 750 gallons per minute will be satisfactory; for average-sized manufacturing properties, 750 to 1,000 gallons; while for large plants 1,000 to 1,500 gallons is desirable, and 2,000 gallons for very large ones. These figures would provide for hydrants and standpipes as well as sprinkler heads. These quantities are equivalent to from two to eight fire streams, and the discharge of this amount inside the plant might seriously interfere with the use of the fire-fighting apparatus on the outside. Consequently a supply stored in elevated tanks within the property should be secured wherever possible, in which case the fire service connection can be shut off when the fire-fighting apparatus arrives. The danger of this bleeding of the mains is so great that the water purveyor should in no case grant a private fire service the capacity of which exceeds 50 per cent of the capacity of the main supplying it.

Question No. 5.—The committee gave the opinions of the boards of health of several states on the subject of permitting cross-connections between fire supplies from the public system and private supplies from polluted sources. Needless to say, all such departments recognize the danger, but vary in the stringency of the measures which they endeavor to enforce to eliminate it. The double check-valve plan is in more or less common use, and one or two alternative plans are suggested by the committee. Their recommendation is summed up as follows: Where an independent supply is used for private fire protection, the fire service connection from the public mains should discharge into either a cistern or an elevated tank at or above the flow line and the protected property be required to take water for the fire protection equipment from the cistern or tank to preclude the possibility of back flow.

When such an arrangement is not possible, double check-valves should be installed with proper means for inspection and testing, as has been described previously before the society and in Municipal Journal and Public Works. These valves should be regularly and systematically inspected and reports filed as to their condition.

Question No. 6.—The committee believes that the water utility should pay the cost of installing the private fire service connection as far as the property line and that the charge for private fire service should be sufficient to cover interest, sinking fund charges and maintenance on the installation. Accessories, including control valves, check valves and alarm valve or meter, should be owned and controlled by the water utility and paid for by it, the rate being sufficient to include a fair allowance for repairs and maintenance and a reasonable return on the cost of the devices.

Question No. 7.—In this connection the committee discussed the decisions of public service commissions and of the courts, and concluded that "there is an apparent unanimity of opinion by courts and public utility commissions to the effect that a water utility which supplies water for private fire protection services performs a service which is in addition to supplying water for public fire protection, and the water utility has a right to make a reasonable charge for private fire protection service."

Question No. 8.—The committee outlines a method of

allocating charges, which is substantially the system adopted by the public utility commissions of New Jersey, Pennsylvania, Maryland, Wisconsin and possibly other states. It reviews the method of establishing rates for all classes of consumers, this process consisting first of determining how much money must be raised through rates and then proportioning the costs so as to raise this sum and place the burden in proportion to the service rendered. The steps in the establishing of a system of rates are then outlined, to the extent of several pages, on the general principle previously described several times by us that the charge should consist of two parts, one a fixed-service charge based upon the connection, and the other a proportional charge based upon the amount of water used. In the majority of cases the first or fixed-service charge would be the total charge for private fire protection service, "which will be the same as would be charged for any other connection of the same size, without distinction or discrimination on account of the purpose for which the connection is desired."

THE WAR AND THE WATER WORKS

The Effect of the War Period—1914 to 1918—and Public Control Upon the Water Works of the United States.

By LEONARD METCALF.*

Some months ago the executive committee of this association—the American Water Works Association—asked the writer to prepare for this convention a paper upon "financial control . . . and war-time rulings of public service commissions and capital issues committees on water works conditions, with references to such related subjects as deemed pertinent"; that, as suggested by President Henderson, there might be induced such discussions "as necessary to crystallize those results of war-time activities or stagnation which have affected water-works administration, to the end that managers may carry out the readjustment of their work to meet normal conditions in the best manner possible."

In response to this request, the speaker has reviewed five hundred decisions, more or less, affecting water works, handed down by courts and commissions during the four and one-half year period from January, 1915, to May, 1919, hoping to be able to report to the American Water Works Association their more salient points, or at least the present tendencies and the influences upon them of the war period. The task proved too big for the time available, and the speaker is therefore obliged to limit his comments to the impressions left by his investigation, rather than to attempt an exhaustive analysis of the decisions reviewed.

OWNERSHIP AND CONTROL.

Public Ownership is less attractive to the people in the light of recent experience in public administration of public utilities in construction work—of the Shipping Board, the Housing Bureau, the Railroads, the construction and other divisions of the army at home and abroad—and of the advance in prices of labor and materials. The condition and service of the railroads and of the electric traction properties are far from satisfactory, and their present financial problems seem almost insolvable. Many of the great water works systems are in difficult positions financially. The Government itself, as evidenced by the utterances of Mr. McAdoo, Mr. Hines and many others, has recognized the decline in morale under Government ownership. The attitude of the great daily papers, the country over, in text and editorials, appears overwhelmingly opposed to its extension. Even the utterances of the Church, through Cardinal Gibbons, reflect the same view.

The Jurisdiction of the Commissions in public utility regulation and control is constantly becoming more nearly complete. As the courts limit their action largely to questions of principle, reversals in the interpretation of fact by the commissions are rare. The practical effect of this, from the layman's viewpoint, is that, if the decision of the commission is sound in statement, there is little hope of modification of findings, even though the conclusions reached seem to indicate that no substantial weight was given to certain elements of value or factors affecting it.

Valuation. The commissions continue to tend strongly to original cost, as the fairest measure of value.

Many competent observers believe that past valuations or rating bases have frequently been too low, that the present decline in character or excellence of service clearly reflects this, and that the present rates on money are already, and the future rates will continue to be, higher in consequence of this tendency to undervalue. The difference between actual and assumed value may not always be great, but the tendency is to undervalue, and the influence is therefore usually in one direction. Its result appears likely to be disadvantageous to the public.

The failure of the rates prescribed by certain of the commissions in the past to yield the revenue intended gives further evidence that the companies are too often called upon to bear a burden of hazard of loss, which is disadvantageous to the public.

Overhead Allowances have increased substantially, indicating that the commissions themselves, as a result of longer experience, recognize that their earlier allowances were too close.

Going Value or Development Expense. While the recognition and inclusion of going value or development expense as a property element in the valuation of water works for purchase, sale, or rate determination, has been general and consistent on the part of the higher courts, the practice of some of the commissions appears in marked conflict to this position. The older commissions, however, generally recognize it, though the allowances for it are less than those accorded by financiers and operators in practice and in many actual sales.

Franchise Values per se have shrunk markedly in the past decade, by contrast with the previous decade.

Depreciation. The general treatment of the depreciation allowances has improved immensely, as evidence has accumulated, and this evidence has borne out the contentions of water works operators. The practice in the fixing of the annual depreciation allowance is generally fairer than in determining the accrued depreciation, but this difficulty is reduced by using the undepreciated value as the rating base.

The More Equitable Distribution of the Burden of the Rates is marked. The commissions have generally been steadfast in their insistence that the payment for fire protection service should be commensurate with its cost, and that the distribution as between domestic and commercial or industrial service should also be equitably distributed according to cost, within the limitation of loss of business resulting from raising its cost beyond that at which the industries could supply themselves.

The Position of the Public Service Commission has increased in power and recognition. Their ability and outlook has grown and broadened with experience. The good effect of continuity of service is as marked as is the retrogression due to change, until length of experience and service again make themselves felt.

*Of the engineering firm, Metcalf & Eddy, Boston, Mass.

The mutual respect and cordial relations which exist between the commission and the corporation managers in many states, clearly reflect a better understanding of the real difficulties of the problem, and of a desire on both sides to reach workable standards of service, which shall be of common advantage to the public and to capital, to the operators and the employers of public utilities.

The most serious differences of opinion generally arise through lack of understanding or full appreciation of the fundamental factors and difficulties of the problem.

INCREASE IN CONSTRUCTION AND OPERATION COSTS.

The Marked Increase in Cost of Construction and Operation, which will be discussed in detail, is also reflected in the growing number of cases of advance in rates granted by the regulatory authorities.

A review of the water works decisions contained in the twenty-four volumes of Public Utilities Reports Annotated, published in the four years of 1915-1918, indicates the following approximate number of increases granted:

1915	.....	Increases	granted	to	4 plants
1916	.....	"	"	" 12	"
1917	.....	"	"	" 15	"
1918	.....	"	"	" 67	"

It is important to note that increases were few until the latter part of 1917, or early part of 1918, whereas the marked increase in cost of construction and operation to water works occurred in the latter part of 1916 or early part of 1917. This delay of 12 to 18 months was burdensome to the companies affected, more particularly to those with pumped supplies.

A reading of many of the decisions affecting water works and other public utilities, seems to indicate that it was the effort of the commissions to maintain the financial credit of the corporations, without attempting to make good the entire loss due to the war and abnormal conditions resulting.

THE FINANCIAL BURDENS DUE TO THE WAR WHERE BORNE BY THE WATER WORKS.

In its report to the last convention, the committee on "War Burdens of Water Works in the United States" called pointed attention to the letter of the Secretary of the United States Treasury, Mr. McAdoo, addressed to President Wilson, under date February 15, 1918, in which he said:

> I earnestly hope that you may feel justified in expressing the conviction that the vital part which the Public Utilities Companies represent in the life and war-making energy of the nation, ought to receive fair and just recognition by state and local authorities.

and to the reply of President Wilson, under date February 18, 1918:

> It is essential that these utilities should be maintained at their maximum efficiency, and that everything reasonably possible should be done with that end in view. I hope that the state and the local authorities, where they have not already done so, will, when the facts are properly laid before them, respond promptly to the necessities of the situation.

Reference was further made to the fact that the public service commissions and other regulatory bodies in the United States had already shown their appreciation of the serious nature of the conditions confronting the public utilities properties, by granting, in certain recent cases, increase in rates or levying surcharges on existing rate-schedules, after careful review of the local conditions.

The question may now fairly be asked: "Did the regulatory authorities meet the situation?"

The issue is not raised here as to whether they should or should not have met the situation, nor how far sound public policy demanded that rates should be raised to meet the burden of increased expenses, but merely the question of fact—did the commission relieve the public utilities of their increased burdens due to the war?

To this question the answer must be "No," though many substantial increases were granted.

Whatever may have been the theory, principle, or motive governing the action of the regulatory authorities, it is a fact that the relief granted did not cover the change in conditions. It is apparent in the decreased, or suspended, return upon traction, gas, telephone and water utilities. The burden of the tremendous increase in operating expenses, taxes, and cost of money was borne largely by the utilities themselves—by the investor and not by the public—for the time being, at least.

The data submitted herein seem to indicate that the increases granted to waterworks up to 1919 resulted in about a 10% increment in net revenue, and that in spite of this increase, there was a net decrease of approximately 10%.

The position of the regulatory authorities was a difficult one, in view of the abnormal condition of the times and the war needs. Opinion may well be divided as to the limit to which it was wise for the commissions to go in relieving the corporations of their burdensome increase in costs. To the writer it seemed, and has always seemed, that such burdens could not practically be removed by the commissions *promptly*, because this would require too frequent revision of rates, but that the burdens should be recognized and distributed over a somewhat longer period of time, through an increase in return giving adequate margin for their amortization, and for the establishment of reserves to cover the future hazard element.

The fact should be admitted, however, that the hazard of investment was *not* generally removed from the utilities by the regulatory authorities during the war, though relief was granted in many cases which helped to maintain the solvency of the corporations, and this was in some cases, at least, the goal sought.

EFFECT OF THE WAR UPON WATER WORKS REVENUES AND EXPENSES.

The situation with regard to the water works of the United States is probably fairly shown by the following† comparative records of about 50 plants with aggregate annual revenue of about $35,000,000, and supplying a total population of upwards of 9,000,000 persons, or nearly 9% of the entire population of the United States.

The records made available to this society at its last convention, through the efforts of the Committee on War Burdens of Water Works in the United States, and the courteous co-operation of the managers of these works, have been brought down to date, December 31, 1918, by the writer, through the further interest and assistance of these managers. The cost records which follow the revenue and expense records, will be further supplemented by Frank C. Jordan, secretary of the Indianapolis Water Company, who has made an independent investigation of this subject.

These records indicated that:

1. The annual revenues *with such increase in rate schedules as were granted by the regulatory authorities and put into effect by the plants,* have increased at an average rate of approximately 7% per annum, slightly less than a normal amount.
2. The operating expenses, including taxes where taxes are paid, and excluding them where none are paid, have increased over the year 1915 abnormally—by 13% in the year 1916, 33% in the year 1917, and 52% in the year 1918.
3. The net (operating) revenues applicable to depreciation, interest, dividends and surplus, have substantially stood still since the year 1915.

The average increase in population in this country has been at the rate of approximately 1.9% compounded annually, and of the cities supplied by these 50 typical water works, about 3.1%.

†The records and diagrams will be given next week. The author's summary and conclusions are given below, however.

The net revenue of water works usually increases at the rate of from 4 to 5%* compounded annually. Yet the total increase in the three-year period from 1915 to 1918 is but 4% against a normal amount of from 12 to 15%, in spite of increases granted by the commissions.

The records and Figure 3 indicate further that the increases in rates granted to water works by the commissions seems to have amounted on the average to about 10%, serving thus to decrease the loss in net revenue in the year 1919, from 20%, more or less, to 10% or thereabouts. If this inference is sound, the loss in operation was divided equally between the works and their consumers.

It is clear, however, that the burden of increased operating expenses, plus the interest upon the new investment put into these properties during the war period, has been borne by their owners in larger measure than by the public, except in the case of publicly owned works.

It is interesting to note further that the adverse conditions in the western group of water works, do not appear to have been quite so aggravated as elsewhere in the country. This is probably accounted for by the facts that a larger relative proportion of the water served by the western, than by the eastern works—the records of which are here cited—is brought to the consumer by gravity, and that the advance in their labor costs have been relatively less, though they were at a higher point before the war.

Unskilled labor costs, in cents per hour, did not generally feel the influence of the war until the middle of the year 1916. As compared with pre-war conditions, reflected by the prices prevailing in 1915—they increased one-eighth in the year 1916, one-fourth in the year 1917, and nearly three-fourths in the year 1918. It is interesting to note further that the increase was felt most markedly in the South and upon the eastern seaboard, being nearly doubled in the first, and increased by three-fourths in the latter district. The wages paid upon the Pacific Coast before the war, which were much higher, have advanced relatively less than elsewhere, so that at the present time the eastern and western unskilled labor prices are about the same. Thus the average rate in the western group increased from 27c per hour in 1915 to 42c in 1918; while the southern rate increased from 18c to 34c; the central group from 22c to 37c, and the eastern group from 23c to 40c.

It is important to note further that even these rates are probably below current comparable rates for other labor.

Cast iron pipe prices, which had about trebled at their maximum point, have now receded to about 2 times pre-war figures.

Valves, hydrants and pumps, which had more than doubled in price, are now to be had at an advance of something over seven-eighths of pre-war prices.

Coal and fuel oil prices, which more than doubled, have receded somewhat.

Chemicals used in the purification of water, which, by reason of outstanding contracts showed an average advance of but one-third, though the market price had increased approximately three-fourths, have decreased so that the present excess cost is about one-half over pre-war prices.

FUTURE PRICES.

Engineers prefer the roll of interpreter of facts to that of prophet of the future. It is desirable, however, to note here probable future price tendencies, and it is to be hoped that there may be general discussion upon this subject, to the end that members of this society may have the benefit of comparing views, and may thus be able to plan more wisely for the future.

First: With respect to unskilled labor—While it is possible that there may be some reduction in its cost during the coming season, no marked change is to be looked for; and with respect to the rates paid to water works employes, it is believed that the prices now paid are likely to continue in most cases, and to increase rather than decrease in the remaining cases.

Unless Bolshevism runs its course in this country, or industrial depression should follow the war—neither of which seem likely—an active demand for labor is to be looked for in the near future. It is to be remembered that despite the war, the population of this country has been increasing at a rapid rate. Immigration has been at a standstill, and in the light of home demand for labor abroad, does not seem likely to be active for some time to come. Many employers, contractors and labor leaders believe that in the not distant future this country is sure to feel the competition for avilable labor, and that this will stimulate yet higher wage scales. Past experience following wars indicates that later on reaction may come, and business depression be felt for a time, but such influence is not likely to be of long duration or to affect permanently the upward tendencies.

Second; With respect to materials of construction, there is greater hope for relief. Nevertheless, no substantial reduction in the price of cast iron pipe, valves and hydrants seems likely for the present year, and but a gradual reduction is to be looked for in the future. In spite of the increased facilities for production, the labor, transportation, and money conditions involved seem likely to make themselves adversely felt for some time, and the losses resulting from the war, permanently.

Third: The materials of operation—coal, fuel oil, and chemicals—do not appear likely to decline markedly in cost, and such tendency toward decrease as there may be will probably cause the making of short-time, rather than long-time, contracts for such supplies.

Declining service. Capital has not been available for many desirable extensions during the war period. The added financial burden of such new construction as has had to be undertaken has in many cases been substantial. The increase in operating costs and taxes has been tremendous.

The structural plans of water works properties have not been maintained generally in normal condition during the war. Such has been the experience abroad, as well as in the United States. The obtaining of needed added supplies, drainage areas and water rights, the enlargement of the mechanical, pumping and boiler plants, the extension and reinforcement of supply and distribution pipe systems, and the making of normal betterments of various kinds, have been deferred, in order to conserve the country's financial resources for war purposes.

It will probably be admitted generally, by water works men, that *the war has enforced upon water works, as upon other public utilities, a declining service.*

THE FUTURE.

The conclusion to be drawn from the present physical and financial condition of water works in the United States seems clearly to be that *necessary improvements should go forward as rapidly as possible.* It is desirable to restore public confidence and further the Government's wise wish to give employment to idle labor. More important yet, *improvements are seriously needed to restore our normal high standard of water service, to adequately safeguard the public health.*

While city officials and water works men are hesitating,

*A recent analysis by the writer, of the increase in operating revenue (applicable to depreciation, interest, dividends, and surplus) in 19 different water works during the five-year pre-war period from 1910 to 1915, showed an *average rate of 4.14% compounded annually.*

the large manufacturing interests dominated by shrewd, far-sighted business men, are going ahead with their construction work, with their plant extensions and housing projects, confident that postponement will at best offset increased cost in small measure, will probably involve loss in service or profit far exceeding any saving in construction cost, and at worst will involve yet higher costs, coupled with these losses and with increasing difficulties due to a vanishing labor surplus.

The public is far more vitally interested in thoroughly good and adequate present service, than in any probable saving to be effected by delaying construction to a later date, in anticipation of further, more or less problematical decline in costs.

SAN FRANCISCO'S HIGH PRESSURE FIRE SERVICE

Formerly Maintained as a Reserve Supply, Now Used as the Main Fire-Fighting System—Difficulties of High Pressure Controlled by Use of Reducing Valve—Description of High-Pressure System.

During the years succeeding the earthquake and fire, San Francisco planned and has gradually constructed a high-pressure water system for fire fighting, which has been held in reserve as an auxiliary to the regular water distribution system of the Spring Valley Water Company. Recently, however, the Fire Department has adopted this as the main fire-fighting system, the fire engines in the high-pressure zone being held as a reserve.

One reason for not using the high-pressure system regularly was the difficulty of handling the high pressures, which ran from 150 pounds to as high as 329 pounds (750 feet head). A former employe of the fire department invented, and the department has adopted, a reducing valve which can be adjusted to reduce the pressure to any lower one desired and maintain it there. It is provided with two outlets, so that, with one of these attached to each of the three 3½-inch outlets of a hydrant, six hose streams can be delivered at the desired pressure. In ordinary service, streams from the high-pressure hydrants are turned on at 120 pounds and held at this, unless orders are received to increase it; this being the pressure at which the fire engines start when drawing from low-pressure hydrants.

It had been planned to remove all engines from the high pressure zone, and rely entirely upon the high-pressure system. This would remove from service a thousand low-pressure hydrants in this territory for which the city paid the water company $30 a year each. But this plan met with great opposition, and even with the regular use of the high-pressure hydrants, the low-pressure ones are being retained in service.

Another reason for retaining the engines in reserve in this zone is the possibility that it will be necessary to pump from cisterns in case of breaks in the mains of both general-service and high-pressure distribution systems. There are 141 of these cisterns, always kept filled with water, their average capacity being 75,000 gallons each.

The high-pressure system cost about $5,750,000; but the insurance rates in the city have been reduced about $1,000,000 a year because of it, and this reduction is believed of itself to justify the expenditure. The saving is partly offset, however, by the cost of maintaining the system, which was $50,000 in 1917, while the interest charge was $275,000. It would seem proper to figure depreciation at not less than 5%, or $287,500. This gives

REDUCING VALVE FOR HIGH-PRESSURE HYDRANT.

HIGH-PRESSURE FIRE HYDRANTS.

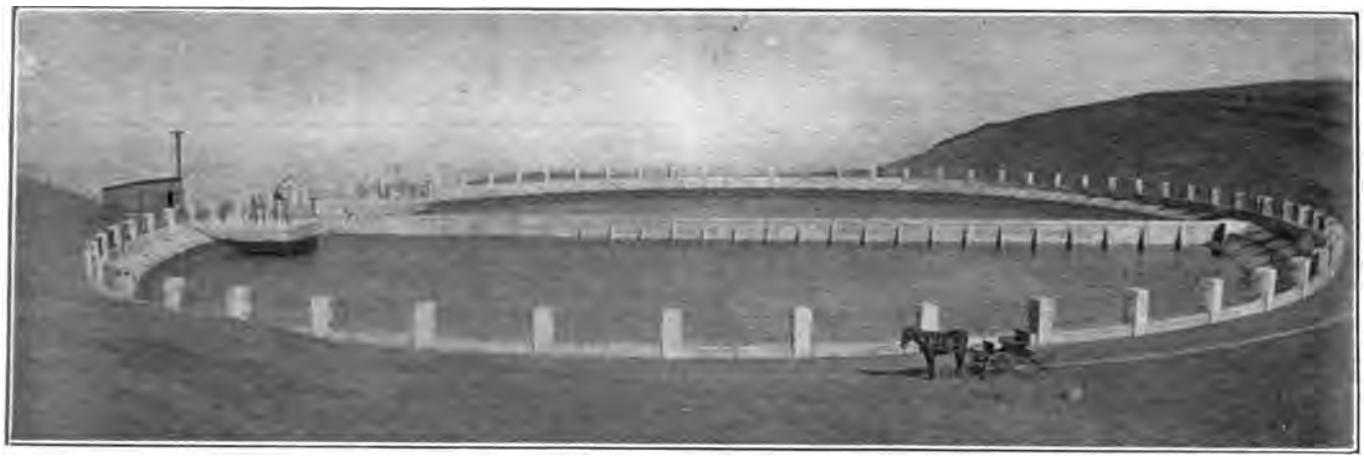
a total of $612,500 as against a saving of a million dollars. The system is being extended year by year into new sections, in each of which the insurance rates are then reduced.

Figured in another way, the high-pressure system was used for 83 fires listed in the latest annual report; making the cost per fire about $7,400 in addition to that of the fire department. But San Francisco lost $325,000,000 in one fire, and her remembrance of this justifies her in an annual expenditure of one-fifth of one per cent of this sum.

The fire protection plan that has been carried out since the 1906 fire includes, besides the high-pressure gravity system, two pumping plants connected to this system, fire boats that can connect to and pump into it, and cisterns scattered throughout the city.

The gravity pressure is furnished by the Twin Peaks reservoir, which is about 750 feet above the corner of Second and Townsend streets, by a tank known as the Ashbury tank, about 495 feet above the same point, and by the Jones street tank, 370 feet above it. Their capacities are 10,000,000 gallons, 500,000 gallons and 750,000 gallons respectively. These are filled with water pumped from the Spring Valley mains into the Twin Peaks reservoir, the pumping plant having a capacity of 1,400 gallons a minute. The water so pumped is paid for by the city, the cost in 1917 being $7,541.

STREET CISTERN UNDER CONSTRUCTION.



TWIN PEAKS RESERVOIR. THE CITY FAINTLY VISIBLE IN THE BACKGROUND.

The Twin Peaks reservoir is oval in shape, 375 by 280 feet, and divided by a central wall of reinforced concrete, buttressed. Two 20-inch pipes serve as both inlet and outlet mains, either pipe serving either reservoir. This reservoir feeds the other two, and the pressure due to its elevation is not generally used in the lower zones (although it can be), but the pressure there is that due to the lower "tanks," about 150 or 160 pounds.

The Jones street tank is cylindrical, of reinforced concrete, 60 feet inside diameter, and 35 feet 10 inches high, artistically finished in white cement with a red tile roof to harmonize with the surroundings. The Ashbury tank is of steel, 55 feet in diameter and 29½ feet high, located 155 feet higher than the Jones street tank.

Each hydrant is plainly marked with the pressure that it is under when receiving its suplpy from either of the two tanks or from the reservoir, so that the fire company officers may know what pressure they will have to handle. Each tank supplies its own district with an average pressure of 150 pounds, but if a higher pressure is wanted, the mains can be connected with the reservoir, giving 60 pounds more in the Ashbury district, and 150 pounds more in the Jones street district.

From these tanks the high-pressure supply is distributed through 72 miles of mains from 20 inches to 10 inches diameter, and special hydrants with 8-inch hydrant connections, each supplied with a valve.

Should the reservoirs fail or their connection with the distribution system be broken, water can be supplied from the bay, by two pumping stations having a capacity of 24,000 gallons a minute under a pressure of 300 pounds. These stations and the distribution system are so interconnected that either station can serve any part of the system that remains intact. The pumping stations have stored in them 1,000,000 gallons of fresh water for boiler feed and 2,400 gallons of fuel oil—sufficient for 96 hours if cut off from outside supplies; have their own lighting plants and well-equipped kitchens.

Two fire boats, for use in case the pumping stations are put out of commission, can pump into the system 10,000 gallons of bay water a minute. They are used regularly for water front protection.

The 141 underground cisterns, provided in case the high-service system is disabled, are of reinforced concrete, most of them beneath street crossings. The average diameter is 30 feet, and capacity 75,000 gallons. No pipes for filling or emptying are rigidly connected to the cisterns, but hydrantmen attend to all cisterns in their respective districts, visiting and inspecting them once a week, keeping them filled with water by using a hose from the fire hydrant, and seeing that they are in proper condition and ready for immediate use at all times. They report the condition of the cisterns each week to the battalion chief of the district in which the cisterns are located. Water in the cisterns is kept from getting stale by the department using it in practice work.

The WEEK'S NEWS

$30,000,000 Highway Bonds for Pennsylvania—Highway Developments in New Jersey—West Virginia Gas Laws Antagonize Pennsylvania—Two Platoons for Elmira and Dallas Firemen—Four Cities Seek Managers.—New York City Wins Old Bond Issue Litigation—President Wilson Appoints Electric Railway Commission—Pittsburgh Tears Up Car Tracks in Paving Controversy.

ROADS AND PAVEMENTS

To Issue $30,000,000 Highway Bonds.

Harrisburg, Pa.—Governor Sproul has officially notified the legislature that during the next two years $30,000,000 worth of bonds will be issued for road purposes, the bonds to extend for 30 years and bear interest at 4½ per cent. The governor will issue $12,000,000 worth about July 1, 1919, and $18,000,000 about July 1, 1920.

Road Bond Issue Wins under New Law.

Waterloo, Ia.—The first bond election to be held under the new state highway law has resulted in a vote of approval in Blackhawk county. It is planned to improve 84 miles of highway with the issue of $1,500,000.

Highway Progress in New Jersey.

Trenton, N. J.—The following report has been received by Governor Edge from the state highway department relative to the resumption of the construction of highways in this state after the government's curtailment due to war conditions: "The construction program of the state highway commission for 1918, which included approximately fifty miles of new construction, and which was completely stopped last summer by federal government restrictions, is to be energetically resumed early in the spring. The highway commission now has outstanding contracts, awarded last summer, for $2,500,000 worth of work, which, with the work in the 1919 program amounting to approximately $3,000,000, provides for the completion by autumn, 1919, of nearly 1,100 miles of the new state highway system. This will be welcome news to the thousands of motorists who come to the Jersey coast and mountain resorts from all over the country during the summer, and to the industrial and commercial interests of the state having large sums invested in motor equipment. It is not generally known that the first receipts from the state highway tax levy were not available for use until February of last year, and that federal government restrictions prohibited practically all new construction during 1918, until the signing of the armistice in November, when it was too late to undertake new work."

To Use Big Shell Deposits for Highways.

Baton Rouge, La.—Commissioner M. L. Alexander, following an inspection of the big oyster shell deposits at the mouth of the Atchafalaya River, has announced that the shells, valued, approximately, at from $40,000 to $50,000, will very soon be dredged out and used for road-building purposes, concrete making, and chicken food, the beds having been leased to Alfred Mead and a contract having been entered into by him with W. D. Haden, of Galveston, Tex. A station for the distribution of the shells will be established at Morgan City, the nearest shipping point to Point au Fer, where the deposits are located. In the party which visited the deposits were: Commissioner M. L. Alexander, Duncan Buie, state highway engineer; R. V. Glenn, federal highway engineer; Thomas H. Milling, of the Board of State Affairs, and Alfred Mead, lessee. All of the party are confident that the dredging of the shells will go a long way towards solving the problem of building state highways, as the shells are used for both foundation and surfacing, and, while making good roads, are cheap, the estimated cost being $1 per cubic yard delivered at the distribution point. The oyster shell deposits were created through the freshets from the Atchafalaya River having killed the oysters. The removal of the shells will, in addition to furnishing road building material, open the channel of the mouth of the river, prevent the accumulation of back water, and make the growing of oysters in adjacent beds a more successful undertaking, relieving them of the danger of being killed by fresh water. The exploiting of the reef will bring a handsome revenue to the state, it is said. Mr. Mead has closed a contract with Contractor Haden to deliver at an early date 165,000 cubic yards of the shells, which are to be used in roadway construction in the parishes of Terrebonne and St. Mary.

STREET LIGHTING AND POWER

Pennsylvania Protests Against West Virginia Gas Laws.

Harrisburg, Pa.—Governor Sproul has signed the joint resolution of senator Crow authorizing action by the authorities of the state to prevent discrimination against the citizens of this commonwealth in the use of natural gas which would result from the law recently enacted by West Virginia. On February 17, 1919, the state of West Virginia enacted a law the effect of which is that the gas produced in that state shall be first applied to the industrial and domestic needs of home consumers before any could be transmitted into Pennsylvania. The resolution sets forth that the people of Pennsylvania have expended enormous sums of money to equip their homes and industrial plants with appliances for the burning of this fuel and to restrict the supply would affect their health, comfort and welfare. The attorney general is directed by the new law to institute such legal proceedings as are necessary to protect the rights and interests of the people of this state who have invested millions of dollars in the exploration for and the development of natural gas wells and fields in West Virginia and the transportation of gas to Pennsylvania

Vote to Extend City Plant for Commercial Service.

St. Joseph, Mo.—At the recent election, voters authorized the issue of $500,000 bonds to finance additions to the municipal electric plant. This plant for years has provided energy for city street lighting, and the plan is to extend it to furnish commercial electric service. These bonds were approved at the same time as issues for several other purposes, including a city hospital, new city hall, sewer and park improvements, etc. Advocates of the issue of $500,000 bonds for the extension of the municipal electric plant promised adequate service. The plant now existing is used to supply energy for the arc-lighting street system, and the proposed enlargement of service will mean an extensive outlay for station and distribution purposes. The local private company had trouble last winter which, it claimed, arose from failure of the city water supply. In the emergency the company had to get its water from a temporary source. This led to troubles with the boiler-feed pump and boilers. There was curtailment of the power supply for about ten days, but the company gave partial service during most of this period. To increase its facilities the company is said to be spending practically $1,000,000 this year, adding 10,000 kw. to its generating capacity.

Rate Increase Refused Because of Inadequate Service.

Osceola, Mo.—The state public service commission has been considering a complaint as to inadequate service by the Osceola Light & Water Company, and a demand by the company for an increase in rates in order to enable it to render satisfactory service. The rate increase was denied for the present, and the company was ordered to make repairs necessary to put its plant and system in proper operating condition. The commission says in part: "Both the electric and water rates are as a whole, as high as are found in most cities of this size in the State of Missouri, and since the plant appears to be operated in an inefficient manner, the defendant will be denied any increased rates at the present time, but will be required to make all necessary and needed repairs to its existing water plant, including the installation of some form of reservoir, standpipe or water tower, and to make all necessary and needed repairs to its existing electric system to enable it to give sufficient and satisfactory service."

FIRE AND POLICE

Two-Platoon System in Effect.

Elmira, N. Y.—The two-platoon system in the fire department has gone into effect, having been adopted unanimously by the police commission. The adoption of the system, which practically means the reduction of 50 per cent of the time each man is required to be on duty, is the result of long and patient effort on the part of Chief John H. Espey. One shift will work 14 hours daily while the other will work ten hours under the two-platoon system, whereas under the old schedule men have been on duty every hour of the day except on the one day a week they were allowed off. This holiday, incidentally, still will be in force. The shifts will change monthly or quarterly, according to the method considered most practicable so that the work will be equally distributed.

Two-Platoon System Improves Department.

Dallas, Tex.—The installation of the two-platoon system for the city's firemen has resulted in marked improvement in the men's attitude toward their work because of the improved working conditions. Before the double platoon system went into effect a fireman had four regular days of recreation each month and one hour three times a day. Now he is never tied up more than fourteen hours in a stretch and every other month he is on duty ten hours during the day and has from 6 o'clock in the evening until 8 o'clock the following morning for his own. New rules were adopted with the establishment of the plan. It was necessary to advance many men to fill places created by the system and to fill the vacancies with new recruits. With the installation of the double shift a system of discipline was introduced into the department which more closely resembles the military. Promptly at 8 o'clock each morning and at 6 o'clock in the evening the firemen in the sixteen houses throughout the city are called to attention by their respective commanders. Facing each other the members of the two platoons form in a single line while the roll is called. A few minutes before the hour the firemen are inspected to see that every man is in uniform and in his place. The relieving commander reports his men present or accounted for and when the signal is sounded, signs a receipt which holds him responsible for the apparatus and equipment of the station. The firemen going off duty are required to be in their places and uniform until the hour of dismissal. Exactly on the stroke of 6 and 8 o'clock a button is pressed in the central station near the Municipal Building and a gong sounds in every station in the department. This is the official signal which releases one platoon and marks the beginning of a period of duty for the other. This ceremony takes place simultaneously throughout the city and avoids the confusion attendant upon individual dismissal. From the time one platoon is released from duty until the next muster the men off watch are not required to be at the station. There is but one responsibility incumbent upon them and that is to answer all second alarms. At the present time a system has not been worked out whereby it will be possible to notify the firemen off duty when such emergencies occur, but a scheme is being planned. Some consideration is being given to a plan suggested to mount a big siren on the roof of the municipal building to give warning in case of severe conflagrations. Several other methods, such as connecting the firemen's homes by wire with the central switchboard and also arranging for telephone warning are suggested. Unmarried members of the department who desire to avail themselves of the sleeping accomodations afforded in the station houses are privileged to do so, and there are sufficient men who do this to insure the double protection. These members are not required to respond to alarms while off duty and are not called into action unless an emergency arises. Everywhere the system has met with approval. A new spirit has found its way into the entire scheme. At the cenrtal station the firemen have inaugurated a system of fines to eradicate any chance of untidy surroundings. A schedule of fines is posted on the bulletin board and every man caught throwing a cigarette end on the premises forfeits 2c. A stray match costs the unlucky man 1c, and more serious offenses are followed by heavier punishments. Similar schemes have been introduced in almost every other fire station in the city. Chief Myers is convinced that the Dallas fire department will demonstrate so ably the advantages of the new plan that many cities throughout the state will follow.

GOVERNMENT AND FINANCE

Cities Want Managers.

Gastonia, N. C.—At a recent election, the town adopted a "plan D" charter, providing for the commission-manager form of government, by a vote of 162 to 3. The new plan goes into effect at once and a manager will be appointed. The population is about 20,000.

Alliance, Neb.—This city is considering the adoption of a manager administration and has requested applications from suitable candidates. The salary will be about $3,500. Communications are being received by Ben Fallows, editor, Alliance Times.

Elizabeth City, N. C.—This city has been operating under a manager charter for about four years and is now seeking a new manager. The last one received only $1,200 a year, but the new council will pay a salary of $2,400, the maximum allowed by the charter. Applications are being received by Winfield A. Worth. The population is 10,000.

Woodstock, New Brunswick—The city is seeking a man to serve as city engineer and superintendent of public works whose powers will approximate those of a town manager. The salary will range from $2,500 to $3,000. The population is 4,500.

City Wins Old Bond Issue Suit.

New York, N. Y.—Corporation Counsel Burr has announced that the city has been successful in the suit brought by Commodore E. C. Benedict in the New York Supreme Court to hold the city responsible for $1,000,000 of certificates held by Long Island City before consolidation. The litigation arose out of the issue of certificates for the improvement of the First Ward of Long Island City under an act adopted by the Legislature in 1874. Commodore Benedict contended that, as the bonds had not been redeemed by the city treasurer of Long Island City, the city of New York, as his successor, was liable for the payment of the bonds. The certificates, it was contended, could be used in the payment of taxes levied against properties in the Long Island City section and in redeeming property sold for nonpayment of taxes. Under the statutes which authorized the issue the treasurer of Long Island City was compelled to sell the property for not less than the amount of the assessment, and when he accumulated certificates to that amount they were to be redeemed. Subsequently the law covering the sale of property for

the nonpayment of taxes was amended to permit the treasurer of Long Island City to sell at less than the amount assessed. Commodore Benedict contended that this militated to such an extent against the value of the certificates that in time they became worthless. He alleged that protests were made by his representatives at the time of the sales but were ignored by the Long Island City treasurer. About 1910 Commodore Benedict began action to impose a trust on the city of New York. It was alleged that the law permitting the sale of property for unpaid taxes was unconstitutional.

TRAFFIC AND TRANSPORTATION

Federal Commission To Investigate Street Railways.

Washington, D. C.—Following recommendations by Secretary of Commerce William C. Redfield, and Secretary of Labor William B. Wilson, President Wilson has appointed the Federal Electric Railway Commission to investigate the problems of the street railways for the country. The President appointed the following members to serve without compensation: Edwin F. Sweet, Assistant Secretary of Commerce; Royal Meeker, Commissioner of Labor Statistics, Department of Labor; Louis B. Wehle, general counsel of the War Finance Corporation, who will act during the absence in Europe of Eugene Meyer, Jr., managing director of the corporation; Charles E. Elmquist, president National Association of Railway and Utilities Commissioners; Charles W. Beall, of the American Investment Bankers' Association; Philip H. Gadsden, American Electric Railway Association; William D. Mahon, Amalgamated Association of Street and Electric Railway Employes of America, and George L. Baker, of the American Cities' League of Mayors. The new commission organized by electing Mr. Elmquist, as chairman, and Mr. Sweet, as vice chairman. The action of secretaries Redfield and Wilson were influenced by the financial difficulties of the railway companies in a number of big cities, some of which have gone to the point of bankruptcy. The recent conference of governors and mayors adopted a resolution recommending government consideration of street railway problems. The commission will have no authority to hear and determine specific controversies in any community or in respect of any company. It will attempt to determine the general principles which should govern the regulation, operation and service of electric railways. It will not interfere in any way with the regulatory functions of state regulatory bodies or municipal authorities, its functions being confined to investigation and recommendations. The election of Mr. Elmquist as chairman, is considered an indication that it is not the intention of the new commission to interfere in any way with the powers of states or municipalities. The methods by which the commission hopes to reach its conclusions have not been developed, but will be announced from time to time. Mr. Elmquist said that the commission will not start off with any preconceived notions. "It wishes to make its investigation broad and comprehensive with the view to making recommendations which will be a positive contribution to the solution of the problems which now confront the country. Those problems grow out of the expansion and improvement of service which the public properly demands; out of the great increases in the payrolls; out of the high prices for materials; out of controversies which center around financial organization and methods, and out of franchise relations." In order to explain to all the regulatory bodies the character of the general investigation contemplated, Mr. Elmquist has sent out to all commissioners a copy of the letter to President Wilson from secretaries Wilson and Redfield, with the following comment:

The President has decided to create a commission to make a study of the general franchise and operation conditions of the electric railways in their relation to rates, including service-at-cost plans, state and municipal taxation, local paving requirements, and internal economies that may be effected.

During the war, some of the utilities were in favor of having the President take over certain street and electric lines as a war measure and fix their rates, since the government was fixing the price of fuel and labor, and controlling, to a large extent, the output of the steel mills and other factories. You will recall that the war committee of our association opposed this plan, but suggested to the President, in lieu thereof, that he appoint a federal board to make a study of the utility situation and submit its recommendations to the local commissions and municipalities simply for their help and guidance in the determination of utility questions.

It was felt for some time that such a board would be created, but final consideration seemed to end with the signing of the armistice. It is reported that the readjustment period has not thus far brought any relief to the utilities, and that the condition of many of them is critical. A letter from secretary Redfield and secretary Wilson was wired to the President May 15, and resulted in his determination to create a commission. I think it is in the interest of the public that the state commissioners be represented on this board, because the problem is, after all, local in its nature, and all obtainable information should be brought to the board's attention.

Mr. Elmquist has had long experience in the regluation of public utilities. From 1900 to 1908, he was county attorney of Chisago county, Rush City, Minn. He then became a member of the Minnesota Railroad and Warehouse Commission. For a number of years he was chairman of the valuation committee of the National Association of Railway and Utilities Commissioners, of which, since November, 1918, he has been president and general counsel. Mr. Sweet is assistant secretary of the Department of Commerce. He was formerly mayor of Grand Rapids, Mich., and has served a term in Congress. Louis B. Wehle, representing the Treasury Department, is counsel of the War Finance Corporation. He is a lawyer and has practiced before the Interstate Commerce Commission. During the war he served as counsel to a number of important war boards. Dr. Royal Meeker is statistician of the Department of Labor, and commissioner of the Bureau of Labor Statistics. For five years before his appointment in 1913, he was assistant professor of political economy at Princeton University. His work is widely known. His bureau recently published a 1,100-page report on employment conditions on the street railways. Mayor George L. Baker, of Portland, Ore., is chairman of the organization committee of the recently formed American Cities' League of Mayors. P. H. Gadsden is chairman of the committee on readjustment of the American Electric Railway Association, and has been in the business for over twenty years. Charles W. Beall is a member of Harris, Forbes & Co., New York, and is a financial adviser of long experience in the investment field. W. D. Mahon has been president of the Amalgamated Association of Street and Electric Railway Employes, since it was organized in 1892. He is a member of the executive committee of the National Civic Federation and of the American Federation of Labor. He has taken a leading part in a number of strikes.

City Tears up Car Tracks in Paving Fight.

Pittsburgh, Pa.—The long controversy between the city and the street car company recently became vigorous by action on the part of the city. After argument with the receivers of the Pittsburgh Railways over the street pav- a gang of city workmen was sent out to remove the tracks from a section of Warrington Avenue. Within six hours an injunction to restrain the city had been granted and dissolved. The tracks were then removed. The cause of the controversy between the city and the receivers is an ordinance which has been in effect a long time, requiring the company to repave between its tracks whenever the city improves a street. Ever since the financial difficulties of the railway reached a crisis with the appointment of receivers, the city has complained of failure on the part of the company to obey this ordinance. Extensive paving improvements are under way in Warrington Avenue, and the expense to the company of its share would be about $100,000. It has been one of the contentions of the receivers, during disputes with its employes over wage matters and with the public over proposals for higher fares, that the present income and expenses of the company do not allow money even for such essential expenditures as this. The section of track the city has torn up is not in use. Cars are running on other portions of the street for which improvements are contemplated, but an agreement on division of expenses as expected to be reached before there is occasion for the city to tear up any more track.

NEWS OF THE SOCIETIES

June 23-26. — SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, Coates House, Kansas City, Mo. Secretary, E. L. Fulkerson, 617 Washington St., Waco, Tex.

June 24-27.—AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University of Pennsylvania.

June 24-27.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

Aug. 26-28.—LEAGUE OF CITIES OF THE THIRD CLASS IN PENNSYLVANIA. Twentieth annual convention, Allentown, Pa. Secretary, Fred H. Gates, city clerk, Wilkes-Barre, Pa.

Aug. 27-29.—VIRGINIA STATE FIREMEN'S ASSOCIATION. Thirty-third annual meeting, Charlottesville, Va. Secretary, E. K. Landis.

Oct. 27-30.—AMERICAN PUBLIC HEALTH ASSOCIATION. Annual meeting, New Orleans, La. Secretary, A. W. Hedrich, 169 Massachusetts ave., Boston, Mass.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Springfield, Ill.

Chamber of Commerce of the United States.

The needs of American business, as seen in the light of war experience and several months of readjustment to peace conditions, were defined by the seventh annual meeting of the Chamber of Commerce of the United States, held at St. Louis recently.

Resolutions adopted by delegates attending the meeting, who came representing every state in the union and some of the insular possessions, express a composite viewpoint of industrial leaders as to the solution of a number of questions that are before the people for settlement.

One of the most important results of the meeting was the approval by delegates attending of a recommendation by the Board of Directors that structural changes be made in the Chamber to permit an expansion of its activities and an enlargement of its usefulness. The proposed plan contemplates establishment within the Chamber of departments designed to deal especially with the following:

Industrial Production; Domestic Distribution; Foreign Commerce; Transportation and Communication; Finance; Insurance; Civic Development.

Chairmen of War Service Committees, who early in the year were formed into an advisory council of American industry, met Monday evening and voted to perpetuate the War Service Committee idea. Speakers from among members of the council declared that so much good had come from organization and operation of the committees that the movement should not be allowed to die.

The annual address of President Wheeler was delivered at Tuesday morning's session.

To facilitate the work of the meeting group sessions were held Tuesday afternoon and Wednesday afternoon. Five groups met Tuesday: Industrial Production, John W. O'Leary, Chicago, chairman; Domestic Distribution (wholesale), A. L. Shapleigh, St. Louis, chairman; Foreign Trade, George E. Smith, New York, chairman; Transportation (railroads), George A. Post, chairman; Public Utilities, Lewis E. Pierson, New York, chairman.

The Industrial Production Group heard George N. Peek, chairman of the Industrial Board of the Department of Commerce on "Price Stabilization"; Herbert E. Miles, of the Department of Labor, on "Industrial Training"; Rush C. Butler, of Chicago, and Frederick Taylor, of New York, on "Trust Legislation."

Domestic Distribution was discussed by Luther M. Walter, of council for the National Association of Owners of Railroad Securities, whose subject was "The Return of the Railroads"; M. J. Saunders, Federal Manager, Mississippi Warrior Waterways, on "Co-ordination of Rail and Inland Waterways Transportation"; C. E. Lightfoot, "Good Roads"; Murray Carleton, St. Louis, "Railroad Rates."

The Public Utilities Group heard a discussion led by Samuel W. Fordyce, Jr., of St. Louis, on "Street Railway Financing"; W. D. B. Ainey, chairman of the Public Service Commission of Pennsylvania, on "The Street Railway Problem as an Operative One," and Festus J. Wade, of St. Louis, on "The Effect on Community Values of Impairment or Suspension of Electric Railway Service."

Under the chairmanship of John W. O'Leary, the Industrial Production Group heard John T. Stone, president of the Maryland Casualty Company, of Baltimore, on "Workmen's Compensation and State Insurance"; Ernest T. Trigg, president of the National Federation of Construction Industries, on "The Building Industry"; and Paul M. Warburg of New York, on "Taxation and Loans."

On Wednesday the Public Utilities Group held an open hearing with a large number of persons joining in the discussion. Highways and waterways formed two groups with E. J. Mehren, editor of the Engineering News-Record, leading discussion on highways and Walter S. Dickey and Thomas F. Cunningham, of New Orleans, speaking on waterways.

Three viewpoints on the railroad problem were presented at a general session Wednesday evening by Walker D. Hines, Director General of Railroads; Senator Albert B. Cummins, and Samuel Rea, president of the Pennsylvania Railroad.

A meeting of the National Association of Commercial Organization Secretaries was held Thursday also. Speakers were J. M. Guild, of Kansas City, president of the National Association of Commercial Organization Secretaries, "The Chamber of Commerce in the Readjustment Period"; Robert H. Manley, of Omaha, and N. B. Kelly, of Philadelphia, "Chambers of Commerce as Employment Bureaus for Returned Soldiers"; William S. Millener, of Williamsport, Pa., and S. B. Price, of Bridgeport, Conn., "Housing Problems"; I. W. Schmidt, of Detroit, and W. F. McNeill, of Chicago, "Americanization Work"; N. P. Neighbor, of Altoona, Pa., and Howard Strong, of Rochester, "The New Relationship of Labor."

Among the resolutions passed were the following:

Government and Business.

The very essence of civilization is that there be placed upon the individual only that degree of restraint which shall prevent his encroachment upon the rights of others, thus releasing to the utmost individual initiative in every proper direction.

Our form of government most effectively expresses and maintains this principle. Within our basic law exists ample provision for such changes as may from time to time be necessary to safeguard our people. It is, therefore, essential that our government should scrupulously refrain from entering any of the fields of transportation, communication, industry, and commerce, or any phase of business when it can be successfully undertaken and conducted by private enterprise. Any tendency of government to enter such fields should be carefully weighed in the light of its possible effect upon the very genius of our institutions.

Construction.

The interests of the public require an immediate resumption of construction activities in order that the housing and other construction needs of the nation necessarily deferred by the war may be provided and that labor may find ample employment.

The Federal Government, especially the Railroad Administration and the Treasury Department, as well as state, county and municipal authorities, should proceed with public work wherever possible.

Street and interurban railways have such a fundamental place in all important communities, and conditions of war have disclosed such acute situations in the affairs of this class of public utilities, that the chamber's Committee on Public Utilities should proceed with its hearings and studies to the end that it may soon place before the board of directors a report with recommendations respecting the procedure which should be followed to place these important facilities upon a basis which will assure their efficient service.

Highways.

That highways are an integral part of our nation's system of transportation has been emphasized by the war, and an enormous development is at hand, so important as to require a comprehensive national policy, under which federal appropriations for highways will be applied to national needs for interstate commerce, agriculture, postal delivery, common defense and general welfare.

Congress should create a federal highway commission, independent of present departments of the government, composed of members from the different geographical sections of the country, to perform all executive functions of the federal government pertaining to highways including those relating to existing appropriations in aid of state construction. Such a commission should act in coordination with any federal agency that may have functions of ar-

(*Continued on page* 461.)

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

STERLING GASOLINE MOTORS.

For Driving Centrifugal Pumps and Electric Generators.

The Sterling engines, manufactured by the Sterling Engine Company, have long been known in the marine field. The records made by the motors have led to the redesigning and adaptation of the engines for stationary work, and there are numerous units installed as standby plants for fire protection; driving centrifugal pumps, and generators. The motors are adapted to this service as they develop their rated power at a speed most desirable for the work.

Enclosure of all moving parts of the models FC and EC is a feature, and there is unusual provision for accessibility. All covers are easily removed and attached, and ample space is provided in which to make adjustments if required. The engines are smooth running and quiet, as vibration has been practically eliminated. Longevity is assured through the extensive use of drop forgings for crankshaft, camshaft and connecting rods, and for bearing caps, crankshaft and camshaft gears, in addition to which bronze and aluminum castings of great tensile strength are specified throughout the motors, the material being the best procurable. Accurate dimensions are adhered to so that parts ordered in replacement will always fit properly.

The design of models FC and EC 17-25 H.P. motors incorporates a hollow crankshaft force feed lubricating system, oil being pumped to all main and connecting rod bearings through the crankshaft, considered the most advanced and efficient system in use today. An oil sight gauge and an oil pressure gauge are provided, so that one has a constant check on the oiling system.

The equipment of electric starter and electric generator, with battery, assures power to meet any emergency. This power is constant, as the motors may be depended upon to run satisfactorily for long periods at maximum r.p.m. under full load.

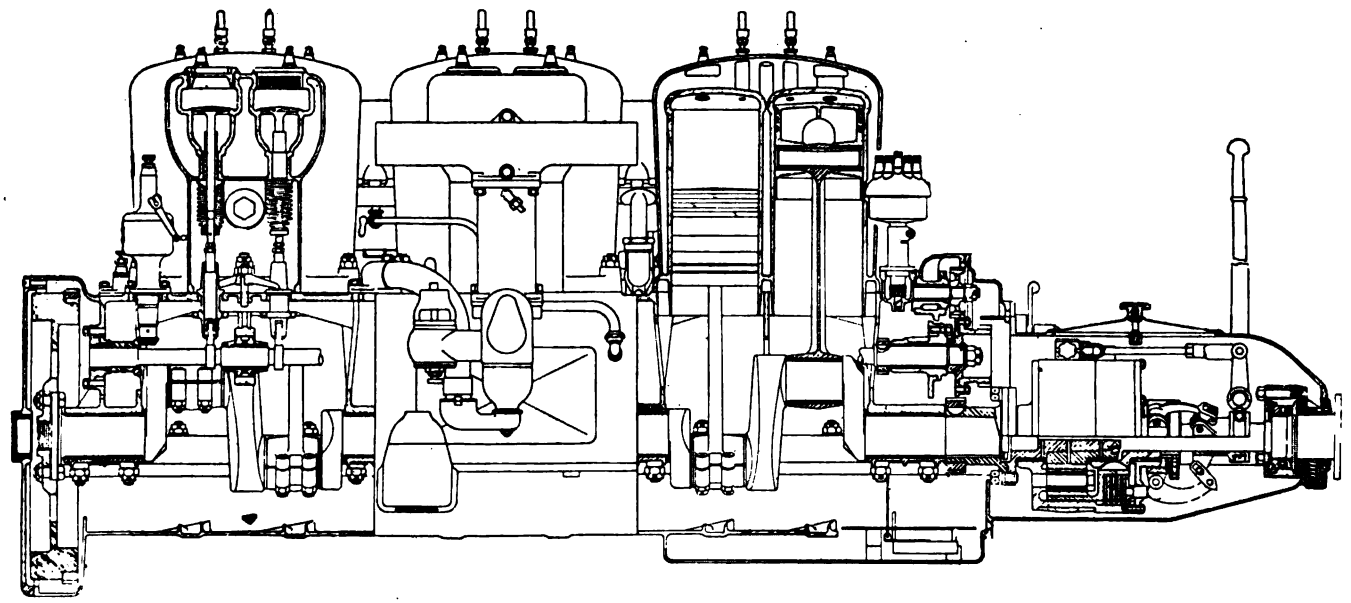
The Sterling line of stationary engines include the following:

Model.	Cylinders.	Bore. In.	Stroke. In.	R. P. M.	H. P.	Base.
FC*	4	5½	6¾	800-1200-1400	55- 85-100	Iron
FC*	6	5½	6¾	800-1200-1400	85-125-145	Iron
FC*	8	5½	6¾	800-1200-1400	115-170-200	Iron lower; bronze upper
FC*	8	6¾	9	800-1000	240-300	Iron lower; bronze upper
DC-12	2	5½	7	400- 500	12- 15	Iron
EC 17-25†..	4	3¾	5½	600-1000-1200	17- 25- 30	Aluminum

*Regular equipment includes electric starter and generator (two units).
†Reguar equipment includes electric starter-generator (single unit).

Model FC motors, having T head cylinders, are regularly designed to turn anti-clockwise facing the flywheel end, but can be furnished for clockwise rotation if desired. The drive is taken from the crankshaft which projects from the after end of the motor, and which is machined for mounting a flexible coupling. The models EC and DC moters, being of the L head type, are built to turn anti-clockwise only. The construction of the base allows a simple foundation. Where a radiator is used an air cooled exhaust manifold with an expansion joint between each cylinder casting is provided; however, a water jacketed exhaust manifold creates less heat, and is a protection for the operator, this type of manifold being installed where a supply of water is available.

These engines are adapted to various types of installations in waterworks and small electric plants. For instance, a number of sets are used by the Navy Department consisting of a model E, 10 h.p. Sterling direct connected to a 2 k.w. a.c. generator and a 1¼ k.w. d.c. generator. The d.c. can be used for charging storage batteries and for other purposes. This set is designed to operate at 1500 r.p.m. and is held accurately at that speed by a centrifugal governor. It is, however, adapted to any use within its capacity, if connected to a suitable generator. The engine could easily carry a 5 k.w. generator, operating at 1100 or 1200 r.p.m. If used in connection with a storage battery, much more power could be supplied intermittently for either lighting or power purposes. It is also suitable for conditions where it is desirable to move the source of power frequently, in which case the set can be carried and operated on a truck. Another combination in use by the Navy is a model FC, 4-cylinder Sterling engine developing 85 h.p. at 1200 r.p.m., direct connected to a 3-stage centrifugal fire pump with a capacity of 500 gallons per minute.



MODEL F GASOLINE ENGINE FOR STATIONARY SERVICE.

INDUSTRIAL NEWS

The Asphalt Association Organized.

Representatives of the principal asphalt producing companies of the United States and Canada have completed the organization of an association, the title of which is to be **"The Asphalt Association."** Its purpose will be to disseminate information concerning the uses of asphalt, with particular reference to highway construction and street paving. It will cooperate with city, county and municipal officials and with scientific bodies and colleges seeking to encourage the most effective methods in the use of this material.

The officers elected for the coming year are: President, J. R. Draney; vice-president, W. W. MacFarland; treasurer, N. G. M. Luykx. The secretary, who will be the active officer in charge of the affairs of the association, is J. E. Pennybacker, formerly chief of management of the U. S. Bureau of Public Roads, and during the war period secretary of the U. S. Highways Council. The New York office will be located at 15 Maiden Lane. Other offices will be established soon at Chicago and Atlanta, and ultimately in Canada and other cities in the United States.

The officers of the new association are widely known in the industry, and their participation in the organization is assurance of recognized standing and effective work. Mr. Draney is the general sales manager of the U. S. Asphalt Refining Co., and of the Bitoslag Paving Co.; Mr. MacFarland is vice-president of the Warner-Quinlan Asphalt Co., and Mr. Luykx is assistant to the president of the Freeport & Mexican Oil Corporation.

The need of such an organization has been felt by Mr. Draney for a number of years, and many months of work were required to shape developments. That it has finally been formed is due to the broad-minded interest, earnest vision and untiring efforts of Mr. Draney.

Southern Asphalt Association.

The Southern Asphalt Association, including the principal public-works contractors engaged in laying asphalt pavement in South Atlantic states, has opened offices in Atlanta, in the Healey Building.

The association will be conducted in the interest of the construction of asphalt roads and pavements in the South Atlantic states. The purpose is to create a wider and better knowledge among public officials and tax-payers of the utility and advantages of asphalt for road and street purposes. This is to be accomplished by a general publicity campaign. In addition, the association will endeavor to keep experienced and skilled workmen steadily employed by putting them in touch with the members of the association who have need for their services.

The following officers have been elected: President, Walter Ely, of the Ely Construction Co., Augusta, Ga., and vice-president, W. R. Mayrant, general manager of the Simmons-Mayrant Co., Charleston, S. C. J. M. Woodruff, who resigned recently as manager of the advertising and paving department of the Standard Asphalt & Refining Co., of Chicago, is general manager. Mr. Woodruff, who has a wide and favorable acquaintance in the asphalt and paving industries in the central and southern states and a broad experience in the field, has also been connected with the Standard Asphalt & Rubber Co., Chicago, as manager of publicity and paving departments and with Warren Brothers Co., Boston, as southern representative.

Warning Against Impostor.

The Thomson Meter Co., 100 Bridge street, Brooklyn, N. Y., has issued a warning that an impostor is traveling through the New England States; and perhaps elsewhere, representing himself as the relative of a former officer of the company, and as being well acquainted with the present officials and representatives. His story is that he has lost his money and is desirous of returning to New York, and he asks for a loan to pay hotel bills, railroad fare, etc. The company asks that anyone approached by this man notify it or Mr. E. Shedd, 266 Brookline ave., Boston, Mass., by wire.

The Barber Asphalt Paving Co., Philadelphia, Pa., announces that following the promotion of Charles W. Bayliss, formerly manager of the street and road department, to vice-president in charge of sales, the following changes in organization became effective June 1, 1919: J. E. Morris, manager, street and road department, Philadelphia, Pa.; H. M. Stafford will succeed J. E. Morris, as assistant manager, in charge of the eastern district, with headquarters at Philadelphia; F. F. Massey is promoted to succeed Mr. Stafford as assistant manager, in charge of the southwestern district, with headquarters at Memphis, Tenn.; C. R. March is promoted to succeed Mr. T. H. Morris, as sales manager of the Iroquois department.

NEWS OF THE SOCIETIES

(Continued from page 459.)

ticulating rail, trolley, water and highway transportation.

Congress should make substantial appropriations for the construction and maintenance of a national highway system to serve the need for the maintenance of interstate travel and traffic.

The commission should report to Congress a plan for continued aid for state construction of highways in the period beyond 1921, to which time the provisions of existing federal-aid laws extend.

Expenditures of funds should be permitted only for highways which are of a permanent type, having thorough drainage, substantial foundations, sufficient width, and a capacity for traffic which will be reasonably adequate for future needs.

Waterways.

While the utilization of natural resources, the development of industries and extension of commerce depends upon adequate transportation, existing facilities are inadequate to meet the increasing needs of the nation.

We urge that the Government speedily complete river improvement projects already authorized, and that Congress provide for a comprehensive system of waterways with co-ordination of the services of waterways and railways.

Adequate terminals are essential to waterways for the economic exchange of traffic.

We recommend to the directors of the chamber the appointment of a special committee to study these questions and to invoke national legislation, where necessary, for the accomplishment of the above purposes.

Water Powers.

True conservation of the waterpower resources of the United States in the acceleration of its industrial and commercial progress awaits the enactment of appropriate legislation. After a referendum to the membership, this chamber has announced the principles which it advocates in such legislation. Legislation very largely in accordance with these principles was practically agreed upon by the last Congress. The new Congress is urged to enact such legislation in the early days of its forthcoming session.

National Budget.

A national budget will introduce standards of business in co-relating income and outgo and afford information as to the disposition and sources of public funds. Expenditures of the federal government have reached sums beyond all earlier contemplation. Taxation and borrowing have assumed proportions hitherto unknown. Through referendum and by vote of delegates in annual meeting this chamber has repeatedly advocated a budget system as a means of introducing business methods in the government's fiscal affairs. We affirm these declarations.

The budget system should be accompanied by a central governmental agency which will be permanent and properly equipped for proposing standardization, simplification, and increased efficiency in government offices. For this purpose Congress should authorize, and the President appoint, a commission to which the President may look for suggestion of improvements in the administrative organization and methods of the government.

American Institute of Electrical Engineers.

At the annual business meeting of the American Institute of Electrical Engineers, held in New York, May 16, the following officers were declared elected for the year beginning August 1, 1919: president, Calvert Townley, New York; vice presidents, Charles E. Skinner, Pittsburgh; John B. Fisken, Spokane; N. A. Carle, Newark; L. R. Jorgensen, San Francisco; Wills Maclachlan, Toronto; A. M. Schoen, Atlanta; managers, L. E. Imlay, Niagara Falls; L. F. Morehouse, New York; F. F. Fowle, Chicago; treasurer, Geo. A. Hamilton, Elizabeth, N. J. (re-elected).

The above, together with the following hold-over officers, will constitute the board of directors for the next administrative year: C. A. Adams, Cambridge; W. A. Del Mar, New York; G. Faccioli, Pittsfield; W. A. Hall, Lynn; E. H. Martindale, Cleveland; F. D. Newbury, Pittsburgh; E. W. Rice, Jr., Schenectady; Charles Robbins, Pittsburgh; Charles F. Ruffner, St. Louis; W. I. Slichter, New York; Wilfred Sykes, Pittsburgh.

At the meeting of the board of directors held on the same date F. L. Hutchinson was re-elected secretary of the Institute for the coming administrative year.

THE MUNICIPAL INDEX

(Continued from last week's issue)

Comparison of Truck Rates and Freight Rates on Short Hauls. Truck rates on short hauls out of New York much less than railway rates for corresponding distances, according to figures compiled by W. J. L. Bauham, traffic mgr., Otis Elevator Co., and printed in Commercial Vehicle. 700 words. Engineering and Contracting, May 7. 15 cts.

Keeping Truck Costs. Truck owners and manufacturers have perfected what they call the "national standard truck cost system," and already 18,000 trucks are being kept by this system. 300 words. Municipal Journal and Public Works, May 3. 10 cts.

The Highways Transport Committee. Outline of its past work and future policy in promoting motor truck transportation. By John S. Cravens, Council of Nat. Defense. Address at Nat. Ass'n of Motor Truck Sales Mgrs. at Philadelphia. 1,000 words. Good Roads, May 8. 10 cts.

A Motor Truck Is Only as Efficient as Its Body. Equipment must be adapted to particular conditions; accessory equipment that facilitates motor truck operation. 2,000 words. Engineering and Contracting, May 21. 15 cts.

Motor Equipment of United States Army Engineer Corps. Motor truck adapted to many purposes; portable carpenter, machine, blacksmith and printing shops and search-lights. 9 ills., 1,300 words. Engineering News-Record, May 29. 20 cts.

Miscellaneous:

Transportation Surveys for Rural Motor Express Routes. Influenced by two general factors, (a) volume of business or tonnage, and (b) those surrounding conditions which have a direct bearing on the business. By J. A. Collins, investigator of market surveys, Bureau of Markets, U. S. Dept. of Agriculture. Paper before National Highway Traffic Ass'n. 1,800 words. Good Roads, May 17. 10 cts.

Wanted: Rural Motor Express in the State of New York. New transportation need in New York State. From paper at meeting of National Highway Traffic Ass'n by James E. Boyle, extension professor of rural economy, College of Agriculture, Cornell University. 1,800 words. Good Roads, May 17. 10 cts.

Traffic Engineers for Highway Departments. A. A. A. official points out need for experts on traffic and transportation, as well as construction and maintenance. 500 words. Good Roads, May 3. 10 cts.

Car Body Maintenance in Belfast. Original improvements which have been made to prolong the life and strengthen the structure of double-deck cars. By P. Williamson, car works supt., Belfast city tramways. 2 ills., 2,200 words. Electric Railway Journal, May 31. 15 cts.

Six Years of Rapid Transit Progress in New York. Construction enterprise greater than Panama Canal carried on at remarkable rate despite war interference; over four times as much work accomplished as on old subway. By D. L. Turner, chief engr., public service commission for first dist., N. Y. C. 6 ills., 2,700 words. Engineering News-Record, May 1. 20 cts.

MISCELLANEOUS.

Miami Flood Control Works. Plans form important chapter in investigations made by the engineering staff of the Miami Conservancy District. 200 words. Municipal Journal and Public Works, May 10. 10 cts.

New Classification Proposed for Rock to Be Excavated. Geologist bases grading rules on ease of excavation and true geological composition. 1,200 words. Engineering News-Record, May 8. 20 cts.

Progressive Erosion in a Dredged Drainage Channel. Observations on enlargement and effect on capacity, together with computations of value of n in Kutter's formula. By C. E. Ramser, senior drainage engr., Office of Public Roads & Rural Engrg., U. S. Dept. of Agriculture, Washington, D. C. 4 ills., 1,100 words. Engineering News-Record, May 1. 20 cts.

A Review of Modern Steam Shovel Practice, with Recommended Procedure. Capacity doubled in two decades; fixed or rotating bodies; dipper and boom operation. Reprinted from Canadian Engineer. By Capt. Llewellyn N. Edwards, supervising engr. of bridges, Toronto. 3 ills., 4,000 words. Municipal and County Engineering, May. 25 cts.

Methods and Costs of Stump Removal in Land Clearing. Dynamite in stump removal; methods of loading and firing; capstan pullers. 3 ills., 3,000 words. Engineering and Contracting, May 21. 15 cts.

Inspection of Drainage Ditch Cross-Sections After Contract Dredging. Soundings first made by level rod gave way to lead and line following along tape; boat used by sounding man was pulled across by means of tape. By E. S. Blaine, engr., Little River Drainage Dist., Kennett, Mo. 7 ills., 3,500 words. Engineering News-Record, May 22. 20 cts.

Cost Accounting as Applied to Sand and Stone Production. Purpose is to show that the accounting department of present-day sand and gravel business can be made as valuable an essential to the business as the producing or selling departments. By Tom P. McGrath, McGrath Land and Gravel Co., Lincoln, Ill. 800 words. Engineering and Contracting, May 21. 15 cts.

Accounting as Applied to the General Contractor. Wide difference in method or rather lack of method in accounting partially responsible for the feeling of distrust in the mind of bankers and bondsmen toward contractors. By L. A. Weatherwax, of Hendrickson & Co., Inc., Seattle, Wash. 1,500 words. Engineering and Contracting, May 21. 15 cts.

What the American Army Engineers Did in the War. Part of an official report made by Benedict Crowell, ass't secretary of war and director of munitions, tells in detail the extent of America's participation in the mechanics of the war; road building under enemy fire. 2,000 words. Engineering News-Record, May 15. 20 cts.

Low Labor Output in War Work Not Due to Cost-Plus Contract. Interviews with contractors prominent in war work indicate low efficiency of labor resulted from long hours and excessive demand. Editorial Interview. 1,200 words. Engineering News-Record, May 8. 20 cts.

Cost-Plus Contract Incentive to Close Management. Contractor creates a clientele of customers and not merely a chance to bid again, says prominent cost-plus advocate. Editorial Interview. 1,000 words. Engineering News-Record, May 1. 20 cts.

National Department of Public Works. In a meeting of the Western Society of Engineers under the auspices of the Engineering Council the project to form a department of public works with a cabinet officer at its head met with unanimous approval. 2,500 words. Engineering World, May 1. 15 cts.

Engineering Societies Organize to Push Public Works Department Bill. 74 societies represented at conference in Chicago; principles adopted with reference to character of proposed department. 7,000 words. Engineering News-Record, May 1. 20 cts.

Proposed Schedule of Engineers' Salaries. For all grades, from chief or city engineer to inspector, on the various kinds of public work. 1,000 words. Municipal Journal and Public Works, May 31. 10 cts.

To Promote Interests of Public Engineers. To be the chief beneficiaries of the labors of the American Association of Engineers during the next year; editorial suggestions. 1,400 words. Municipal and County Engineering, May. 25 cts.

The Engineering Alliance. Some future developments in engineering as seen from a highway standpoint. Abstract of paper before N. Y. Chapter, American Society of Civil Engineers, by H. E. Breed, consulting engr., N. Y. 3,800 words. Engineering World, May 15. 15 cts.

The Engineer in Politics. Engineering societies have too often held themselves aloof from political subjects; political activity beneficial to the association. By W. A. Stinchcomb, county engr. of Cuyohoga Co., Ohio. Paper before American Ass'n of Engineers. 1,600 words. Municipal Journal and Public Works, May 31. 10 cts.

The Engineer as a Citizen. Essential to civilization; should study legislation and administration; morale important; responsibility in civic life; his relation to public opinion; eliminate expensive system of competition in production and distribution. Papers by P. N. Moore, Calvert Townley, N. P. Lewis, Spencer Miller, C. A. Adams before the Metropolitan District Engineers, N. Y. C. "Mechanical Engineering." 4,000 words. Canadian Engineer, May 22. 15 cts.

Some Present Problems of Public Utilities. Portion of address delivered before the Illinois Gas Ass'n by a public utility man qualified to speak with authority. By Samuel Insull, Chicago, Ill. 1,700 words. Gas Age, May 1. 20 cts.

Problem of Financing Public Utility Companies. Public more interested in utility stocks than is generally realized; maintenance of credit; other factors. By C. Corey, vice-pres., Harris Trust and Savings Bank, Chicago. 1,000 words. Electrical Review, May 17. 30 cts.

Public Ownership of Public Utilities. Editorial referring to article in this issue by one who has for over 20 years managed one of the most successful municipal plants in the country. 300 words. Municipal Journal and Public Works, May 24. 10 cts.

Ownership or Control of Utilities. Advantages of each discussed by one who has had 22 years' experience as head of a municipal plant. 1,000 words. Municipal Journal and Public Works, May 24. 10 cts.

Municipal Bonds. April, 1918, a record for recent years and April, 1919, has been surpassed by only three Aprils. 100 words. Municipal Journal and Public Works, May 10.

Educating the Taxpayers. Editorial referring to Detroit's experimental filtration plant. 200 words. Municipal Journal and Public Works, May 10. 10 cts.

Prices During the War and the Readjustment Period. Rise in this country not so great as in others; great increase in currency; prices during and after the Civil War; a new price level established. Abstract of paper before the N. Y. Chapter of the American Institute of Architects by T. S. Holden, investigator, Economic Section, Div. of Public Works and Construction Developments, U. S. Dept. of Labor. 2 ills., 2,800 words. Engineering and Contracting, May 28. 15 cts.

Prices Yesterday, Today and Tomorrow. An address before the editorial conference at the N. Y. Business Publishers Ass'n by O. P. Austin, statistician of the Nat. City Bank of N. Y. C. 4,000 words. Gas Age, May 1. 20 cts. Engineering and Contracting, May 14. 15 cts.

Neurasthenia a Growing Disease in Engineering Work. May be caused by accident, overwork, grinding routine or outside worries; expert care imperative. By C. C. Sherlock, Des Moines, Ia. 700 words. Engineering News-Record, May 8. 20 cts.

Reorganization of the Engineering Standards Committee. Effect of engineering standards movement on technical societies; reorganization to give broader representation; association may be formed to elect the committee; formulating safety codes. By Edward B. Rosa, chief physicist, Bureau of Standards, Washington, D. C. 2,100 words. Engineering News Record, May 1. 2,700 words. Engineering News-Record, May 8. 20 cts.

Present Status of Photographic Mapping from the Air. Airplane mapping possible and practicable, but two great problems, horizontalization of camera and effects of surface relief, must be solved. By J. B. Mertie, Jr., Associate Geologist, U. S. Geological Survey, Washington, D. C. 4,500 words. Engineering News-Record, May 22. 20 cts.

Methods Used in Aero-Photographic Mapping. Outgrowth of experience in use of panoramic camera in Alaska; application to problems of airplane photography; theory of transforming camera. By F. H. Moffit in "Geographical Review." 9 ills., 4,500 words. Engineering News-Record, May 22. 20 cts.

How the Problem of Filing Drav gs Vertically Has Been Solved. Brie le- scription and illustration of vertica' ile devised by C. B. Ulrich and made b' he Ulrich Planfiling Equipment Co., Ja s- town, N. Y. 1 ill., 600 words. Engi r- ing and Contracting, May 21. 15 ct

A Map-Indexing System Adapte to Small Cities. Number book, with si. le classification scheme combined th four-color card index, used at River le, Cal. By F. J. Calkins, Riverside. 1 ll., 1,000 words. Engineering News-Re d, May 15. 20 cts.

City Recording System for Real E te Titles. Excellent system devised or New Castle, Pa., by City Engineer H. Milholland. 1 ill., 500 words. Eng r- ing and Contracting, May 7. 15 c

MUNICIPAL JOURNAL AND PUBLIC WORKS

CITY COUNTY STATE

VOLUME XLVI
No. 26

New York, June 28, 1919

Weekly—$3.00 a Year
10 Cents a Copy

Entered as second-class matter January 3, 1906, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

Whatever You Have to Say

SPEED LIMIT
ACCORDING TO STATE LAW

Say It With an ING-RICH Sign

An ING-RICH Sign Enforces Safety

When it faces the speeding motorist with its clear, bright, insistent warning he **must** look, he **must** slow down. He cannot pass an ING-RICH sign without noticing it. And when he sees it he must obey. He can't argue with it or forget it. He does what it tells him instinctively.

Strong, not only where you see it—But also where you need it.

WASHINGTON ST.

The Sign of a Good Sign is the Name

ING-RICH

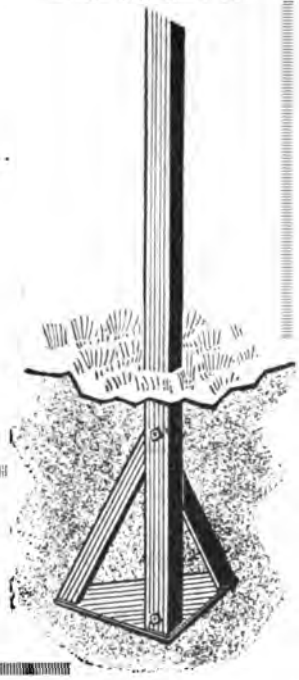
The secret of the ING-RICH sign's commanding presence is in the way it is made. Its bright color is so brilliant that it draws the eye. The color doesn't fade or peel quickly—it lasts for years, because the porcelain enamel is fused into the iron at a heat of 2000 degrees by a special process.

Weather doesn't confuse its message. It does not rust or tarnish on the most exposed road.

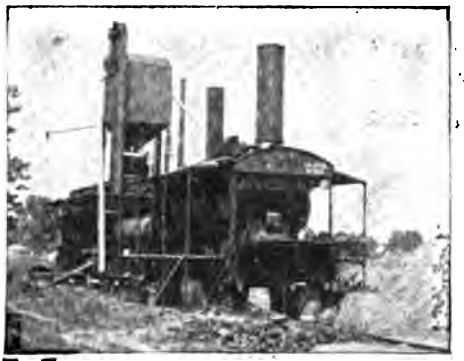
And not only does the ING-RICH sign do its work well—it does it more cheaply. It does not have to be replaced after a year or so. It is guaranteed for ten years.

ING-RICH signs are made for every purpose—not only for safety, but for convenience. Use ING-RICH signs in street naming, in numbering, in guiding traffic. They can be had in all effective colors, sizes or styles—standard or special.

There is much more in signs than you see—let us tell you.



Ingram-Richardson Mfg. Co.
Beaver Falls, Pa.



MUNICIPAL STATIONARY PORTABLE & RAILROAD

ASPHALT PLANTS

THE BEST OUTFITS AND BEST PRICES

WE BUILD THEM OURSELVES

HETHERINGTON & BERNER

INDIANAPOLIS, INDIANA, U. S. A.

CROSS IT OUT

Figure it over again. This time multiply 1c. by the number of cubic yards you must load into trucks. Then add One man's wages for operating the wonderful Haiss Path Digging wagon loader. It has those patented revolving self-feeding propellers. You will land the contract figuring this way.

Booklet No. 219 may mean some good cold profit. Write for it now.

GEORGE HAISS MFG. CO.

146th Street and Rider Avenue NEW YORK CITY

Laborers and tradesmen, any and all classes and nationalities, furnished free of charge to employers. Best of help. 100% services.

DIAMOND LABOR AGENCY

557 West Madison Street, Chicago, Ill.

Phone: Main 5074

WYCKOFF PIPE & CREOSOTING CO.

30 East 42d St., NEW YORK

Send for Catalogue "D"

WYCKOFF

CREOSOTED WOOD BLOCKS

WYCKOFF CONDUIT for underground wires, and all forms of creosoted wood; also Wooden Water Pipe and Steam Pipe Casings. Creosoting Works and Factory: Portsmouth, Va.

WILL NOT BUCKLE OR DECAY

NORTHWESTERN MIXERS

Unequaled for speedy, thorough, economical mixing. Occupy small space. Easily and quickly moved from one part of job to another. Simple, safe and sturdy. Engine is frost-proof, fool-proof and durable. Burns gasoline or kerosene. Cuts fuel bills to the minimum.

Price and Performance will please every buyer

Bulletin No. 31 gives complete information. Write for it today.

NORTHWESTERN STEEL & IRON WORKS

EAU CLAIRE, WISCONSIN

INDIAN ROAD OILS

Manufactured by the Pioneers of the Road Oil Industry

SEND US YOUR INQUIRIES

INDIAN REFINING COMPANY, Inc.

244 MADISON AVENUE NEW YORK, N. Y.

ASPHALT—
THE SUPERIOR PAVEMENT

Atlantic Asphalt pavements are not affected by changes in temperature—they won't crack or crumble under the heaviest traffic.

ATLANTIC
ASPHALTS
"The Ultimate in Road Building"

have proved their superiority in other types of pavings in longer life—less patching and smoother surfaces. Engineers or Contractors who want to do the best, most lasting work, specify Atlantic. There is an Atlantic Asphalt to meet your requirements.

"The Atlantic Highway Digest," issued monthly in the interest of good roads, will be mailed free on request. Write for it today.

THE ATLANTIC REFINING COMPANY
PHILADELPHIA, PA.

Manufacturers of Atlantic Asphalts

KENTUCKY ROCK ASPHALT

"Nature's Own Paving"

Is the most economical hard surface material—requires no plant—only unskilled labor—hand tools and road roller needed.

Kentucky Rock Asphalt is waterproof, dustless, does not wash away or "throw off" under auto or steel tire traffic.

There is no glare and its gritty surface prevents autos from skidding and horses from slipping.

Maintenance Cost—Negligible
Shipped Ready to Lay

Write for Illustrated Booklet and further information

Kentucky Rock Asphalt Co.
INCORPORATED

Paul Jones Bldg. Louisville, Ky.

"Practical Street Construction"

Many books have been written upon paving streets. Others upon artistic treatment, but this is the only one treating of alignment, grade and cross section, the location of sewers and other underground construction, the above ground appurtenances, such as manholes, fire hydrants, fire alarm boxes, street signs and a score of other features that go to make up a complex, modern city street.

"Practical Street Construction" considers each in respect to its interrelation with all others. Each chapter is of real practical value. Diagrams and photographs are used in abundance—never merely for decorative purposes but for the instructive ideas which they illustrate.

Chapters include:

Planning Street Alignment
Diagonal Thorofares
Planning Thorofares
Street Widths
Sidewalk Widths
Gutters
Local and Elastic Streets
Street Cross-sections
Motor Traffic and Street Grades
Intersection Grades
Sidewalks

Written by A. Prescott Folwell

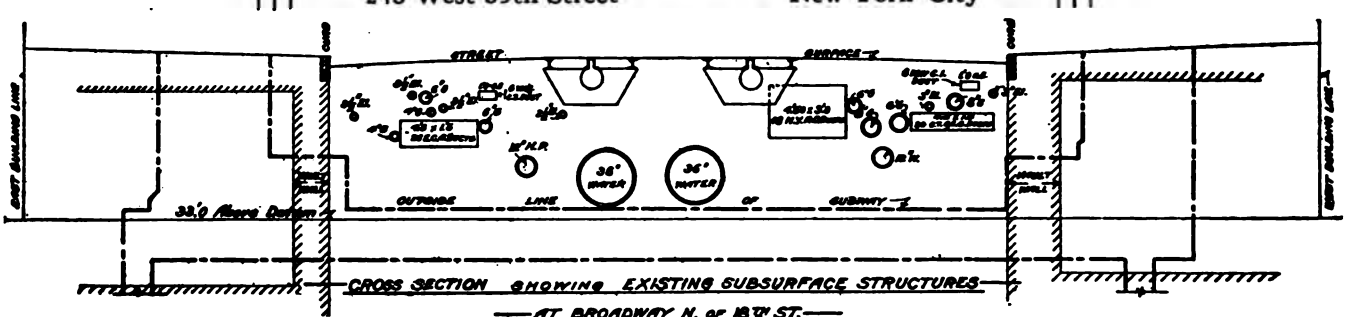
242 pages—151 illustrations

Price $2.00

MUNICIPAL JOURNAL AND PUBLIC WORKS

(Publisher)

243 West 39th Street New York City



CROSS SECTION SHOWING EXISTING SUBSURFACE STRUCTURES
AT BROADWAY N. of 181ST ST.

Resurface with TEXACO

Makes *New Roads* from Old

Worn and unserviceable pavements are changed to smooth, durable and lasting streets by being RESURFACED with TEXACO ASPHALT; miles of highways considered worthless have been transformed to ideal channels of traffic; exorbitantly expensive paving propositions have been materially reduced by saving old streets through the resurfacing process.

Cherry Street, Kansas City, Missouri, resurfaced in 1911 with TEXACO ASPHALTIC CONCRETE over old brick. Photo taken May, 1919.

TEXACO IS AT YOUR SERVICE

Don't be reluctant to ask for proof of why TEXACO serves the BEST. Our expert chemists and highway engineers are ever at your SERVICE. Inquire of us how to make your old roads new by resurfacing; or if the problem be a new road we shall likewise be pleased to assist you.

The Texas Company

ASPHALT SALES DEPARTMENT,

17 Battery Place New York City

New York
Philadelphia
Boston
Richmond

Jacksonville
Tampa
New Orleans
Memphis

Chicago
Cleveland
Toledo
Kansas City

Houston
Des Moines
Minneapolis
Wichita

KOEHRING

Koehring Mixer Loader cuts out all wheelers in loading mixer—delivers material into loading skip from any point within 60 ft. of the mixer — measures the aggregate. Write for Catalog E-3.

MECHANICAL LOADING

The Koehring Mixer Loader when materials are on the sub-grade—the Koehring Loading Derrick when batch boxes are made up at central loading station, and transported to mixer by industrial car or trucks—the Koehring line offers complete equipment for mechanical loading. We furnish specifications and irons so you can build your own batch boxes.

Mixer Dependability is still the Greatest Factor of Low-Cost Yardage

All other cost-saving equipment is auxiliary to the mixer. If the mixer stops, the job stops. So the heavy duty Koehring construction is the greatest **sure-profit** factor you can bring on the job. Mixer control, too, must be simplified and centralized, as it is in the Koehring—both by extra automatic action of boom and bucket distribution of concrete and of mixer operation.

9 Blue Prints of 9 Ways to Handle Highway Contracts

Each blue print 36 in. long. Shows several methods of haulage—several plans for loading station—shows how you can sometimes save two-thirds of your haulage equipment—every blue print a valuable suggestion. Ask for Koehring Blue Print Book No. X-1.

KOEHRING MACHINE CO.

MILWAUKEE, WISCONSIN

Sales and Service Offices in all parts of U. S.

KOEHRING CAPACITIES

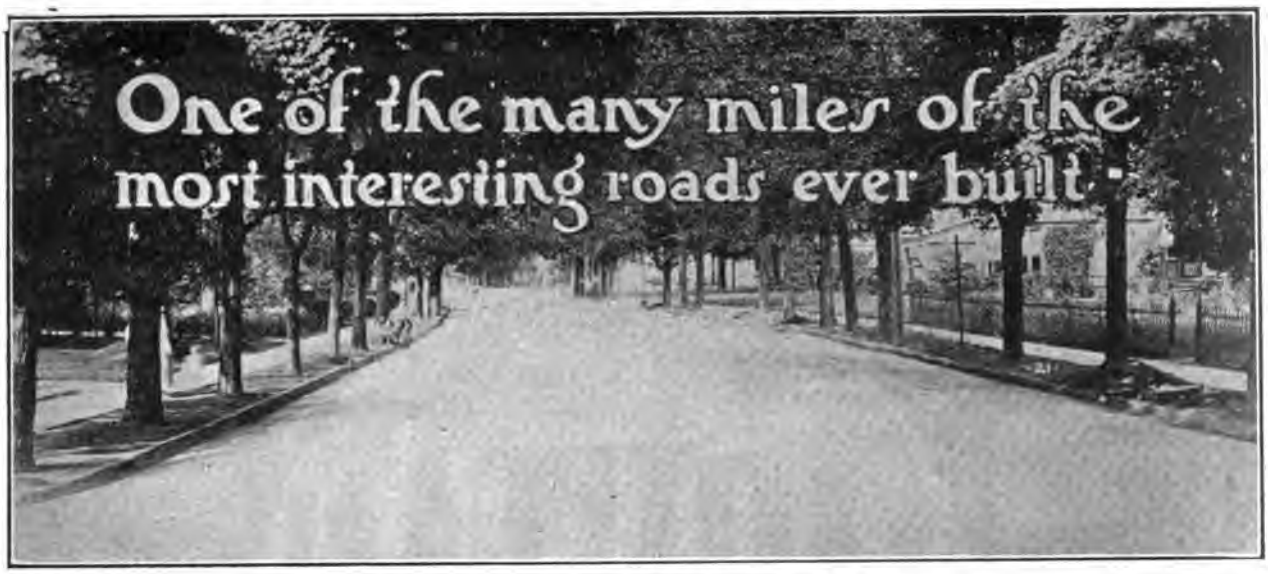
In Cubic Feet Wet Batch Rating

Pavers—12 cubic feet, 18 cubic feet, with or without loading crane to lift batch boxes from industrial cars.

Construction Mixers—7, 10, 14, 21 and 28 cubic feet.

Hot Mixers for Bituminous Work—9 to 14 cubic feet, side charging type; 18 cubic feet, paver type.

Gasoline, Steam and Electric Power



Albany Ave. (Albany Post Road), Kingston, New York

Ever heard of miles of city pavements that begot affection? Miles of pavements laid year after year despite competitive effort of standard road material builders; built by the Willite Road Construction Company of New York, Inc., under **one contract after another,** regardless of tricks, devices and inducements of those seeking to **restrain honest merit; honest methods** and **marked economies** on this great side of public investment, from obtaining a foothold?

If you doubt, write the Mayor of Kingston, New York, about its "Willite" roads—"Willite" methods and "Willite" men—write the Board of Public Works about them—write the City Engineer about "Willite" roads.

If you investigate "Willite" in Kingston or elsewhere, ask the **citizen, the taxpayer, the banker, automobile tourists—truck transportation companies**—inquire of the heads of **its government industries.** A city having miles of "Willite" roads and being completely paved with "Willite" will respond.

WILLITE
TRADE MARK REG. U.S. PAT. OFFICE

Seek the reason. You will find good **roads of maximum life, with minimum maintenance, of finest workmanship** and at a price **providing savings on investment** account and yearly revenue from savings on low cost of maintenance that none can match.

Before these miles of pavement were laid values had been shot to pieces—labor prices were unspeakable — embargoes and delays imposed new costs of operation — but the cost of "Willite" never approached competitive prices. It is the **best, cheapest, most enduring** and **economic pavement** to build and maintain on earth and that is the reason why contract has succeeded contract by the same users and years of demonstration have not worn out its welcomed economies.

To road builders and contractors who can qualify and measure up to "Willite Merit"—"Willite Methods" and "Willite Men," valuable territories East of the Mississippi can be secured. No bonus for exclusive license. We are proposing organizations that will live and last.

Willite Road Construction Company of America
51 Chambers St., N. Y. City

Read these articles every other week on Page 5

Why Sprinkle Your Roads Daily with Water

—when, if the day is hot, the roads dry in an hour or two, and the dust is as bad as ever;

—when MOHTAN is as easy to sprinkle as water, and one sprinkling incorporates the dust solidly in the road, giving a continuous dust-laid condition for days?

Too much watering tends to disintegrate a road, whereas the use of MOHTAN preserves it.

Correspondence Invited

Marden, Orth & Hastings Corporation

(Established 1837)

136 Liberty Street, New York City

Branches and Agents in Principal Cities

Municipal Journal & Public Works.

City County State

Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI NEW YORK, JUNE 28, 1919 No. 26

Subscription Rates.

United States and possessions, Mexico and Cuba.....$3.00 per year
All other countries ..... 4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9691
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, *Editor*
SIMON BARR, *Assistant Editor*

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

Contents of This Issue.

Editorial Notes 463
Cracks in Concrete Roads—Private Fire Services—Refuse Collection Wagons.

Refuse Collection in Rochester (Illustrated) 464
An abstract of the third report of the Rochester Bureau of Municipal Research concerning the activities of the Department of Public Works. Describes existing methods and recommends improvements in equipment and service.

Stresses in Concrete Roads 466
Result of experiments made by Bureau of Public Roads on measured stresses in an actual road, and the causes of cracking.

Suggestions for Concrete Pavement Construction (Illustrated) 467
Conclusion of this article, this instalment dealing with belt finishing, curing, and precautions to be observed by inspectors.

Illinois State Highway Department 468

American Water Works Convention 468
This instalment describes the last half of the proceedings of the convention of the A. W. W. A., the first half of which was described last week.

The War and the Water Works (Illustrated) 472
Tables and diagrams, with explanatory notes, presenting the data upon which the author based the conclusions published in last week's issue. **By Leonard Metcalf.**

News of the Societies 474

Problems Cities Are Studying with Experts 474

Industrial News 475

Personals 476

Contract News 15

CRACKS IN CONCRETE ROADS.

That cracks appear in practically all concrete roads is now generally recognized. They also occur in brick and other block pavements, but as they usually come in the joints they are not so apparent. What causes the cracks—the diagnosis essential to providing the remedy—has been the subject of many theories and investigations. Expansion and contraction due to temperature changes or due to absorption of water and drying out, frost heaving the edges of the pavement, frost heaving the center of the pavement when the snow is on the sides but not the center, soft sub-grade due to lack of drainage, are some of the causes advanced.

In an article in this issue it is suggested that the sub-base is compressed by the depressing of the concrete slab by heavy loads, the return of the slab to its original shape leaving it arched above the sub-base, until finally the arch breaks under a load. This explanation sounds plausible. Probably each of these explanations applies in certain cases, and two or more causes combine in many.

PRIVATE FIRE SERVICES.

Few questions have received more attention from water works conventions during the past five years or so than what to do about private fire protection services. If they are metered, the insurance underwriters kick; if they are not, half of them are used as a means for stealing water in large quantities. Since theoretically no water is used through them, the owners of the protected property object to paying for them.

The report on the subject published in last week's issue of Municipal Journal and Public Works, and the discussion of it in this issue, should do much toward crystalizing sentiment and standardizing practice in the matter. Next week we expect to publish a table giving figures and data from several hundred cities concerning the charges made for private hydrant and sprinkler service.

LOWER REFUSE COLLECTION WAGONS.

There is no treatment of laborers more unjustifiably cruel, we believe, nor one against which they would be more warranted in striking, than the compelling of ash and garbage collectors to lift the containers of those waste materials above their heads to empty them into the collecting wagons. Up to three and a half or even four feet a man can lift a barrel of considerable weight without undue straining; but every foot above that increases the strain in geometrical ratio. Scores of men in this class of municipal service are ruptured every year because of the high lifting imposed on them, while all are fatigued to an unnecessary degree.

To say that this high lifting is necessary is absurd. A collecting wagon with sides rising only four feet above the street is easily practicable, and manufacturers will furnish them if they are called for. But in Rochester (see page 465 of this issue) the wagon side is twenty-one inches higher than this; and nearly as high ones are used in most cities. The height can be lessened by use of smaller wheels, drop axles, longer boxes, wider boxes, or by all combined, which last is probably the best plan. Such a wagon may cost a little more than a standard wagon, but not much more; and if cities were required (as they should be) to pension all men ruptured by such lifting, the pension of one man would be many times the additional cost of a wagon. Moreover, we believe the additional cost would be saved by the greater speed in emptying the barrels and buckets.

How much longer will cities continue this cruel thoughtlessness?

REFUSE COLLECTION IN ROCHESTER

Present Conditions and Practices and Recommended Changes—Organization of Force—Equipment and Methods Employed—Report of Bureau of Municipal Research.

During the past eighteen months we have presented abstracts of two reports of the Rochester Bureau of Municipal Research, one dealing with snow removal and the other with street cleaning. The study of the Department of Public Works made by the bureau has resulted in a third report dealing with the collection of refuse, which completes their description of and recommendations for changes in the activities of the Department of Public Works. These reports have been of unusual interest and value and it is gratifying to learn that the recommendations as to the reorganization of the sanitary forces of the department have been adopted by the commissioner and are now being put into operation.

The report is based upon a study of actual conditions in Rochester extending over more than a year, both observation in the field and a study of the records. It is divided into three parts, dealing respectively with organization and control of the force, equipment and work methods, and co-operation between the public and the department. The study upon which the report was based was made by Carl C. Cooman, assistant engineer, working under the supervision of James W. Routh, chief engineer, (recently made director of the bureau), and was written jointly by these two.

Until quite recently, much less attention was paid by cities generally to the collection of refuse than to methods of disposing of it, most cities retaining more or less primitive methods. But great progress has been made along this line during the past few years and new methods and appliances are being used or developed each year.

In Rochester ashes are disposed of by dumping upon land fills, rubbish by incineration after recovering valuable materials, and garbage by reduction. At present all the refuse originating in the city is collected by city forces and disposed of in plants owned and operated by the city, the city having purchased in 1916 the plant and collection equipment of the Genesee Reduction Company. The magnitude of the collection problem is indicated by the fact that in 1917 the cost was about $320,000 for labor and teaming only, to which should be added $50,000 for administration, supervision and office expenses. There were collected 114,049 loads of ashes, rubbish and garbage, or about 228,900 tons or 514,000 cubic yards. The average production per person was about 1,760 pounds for the year. This was collected at a cost of $1.23 per capita for labor and teaming and an additional 20 cents for overhead expenses.

EQUIPMENT AND WORK METHODS.

Considering first the equipment and work methods, the investigators believe that the segregation of ashes, garbage and rubbish, using at least three separate receptacles and three independent collection gangs, is justified by the revenue derived from the disposal of unmixed garbage and rubbish, and by the freedom from nuisance of ashes dumped when not mixed with either of the other two.

Ash and Rubbish Collection.—In Rochester, ashes and rubbish are collected at the same time, weekly in winter and twice a month in summer, the collection gang consisting of the squad foreman, from eight to eleven men, one rubbish wagon, and from three to five ash wagons, depending upon the heaviness of collection, length of haul and number of loaders. Beginning work about half an hour earlier than the rest of the gang, three or four men in the gang bring the filled receptacles to the curb from their place of storage on the premises, two-wheeled hand trucks being used for this purpose. The contents of these receptacles are loaded on the wagon, one man working with the rubbish wagon and three or four loading ashes. Following the wagons is a man who returns the empty receptacles to the rear of the premises. The collection work generally is done betwen 7 and 11 a.m., and 1 and 5 p.m.

In addition to the regular collection, there are special pick-up teams, which are sent out to collect from schools, factories, etc., where large quantities of refuse accumulate at regular intervals. A considerable loss of efficiency would result if a collection gang were required to do this work in conjunction with its regular routine house collections. The producer is charged for the collection and disposal of trade wastes at the rate of three cents per barrel, tickets purchased from the Department of Public Works being given to the driver on collection, who turns them in.

Garbage Collection.—The garbage collection is done by a separate outfit, the driver of each cart doing his own loading, except in the down-town section of the city, where he is given a helper. Each driver is assigned a team and wagon and a regular route which he is supposed to cover at least once a week. In summer, each driver is supposed to reach the stable before 2 a.m., clean and harness his horse and leave the plant between 2 and 3 o'clock when the collections are sufficient to require the hauling of two loads, or between 4 and 6 a.m. on the days when only one load is to be collected. In winter the drivers leave the plant about 6 a.m., generally collecting but one load a day. In general, each section extends radially from the point where the garbage is delivered, so that each driver has both long and short hauls. Practically all the collection is completed by noon, most of the drivers in fact returning to the plant by 10 a.m., or not later than 11:30.

In collecting, the drivers carry tubs into which they empty the garbage from the receptacles at the rear of the premises. Usually two or three stops (premises

from which collections are made) are visited on one side of the street and then two or three on the other side as the wagon proceeds down the street. Occasionally four or five stops are visited at one trip from the wagon, the collector crossing back yards and vacant lots and even climbing fences in passing from stop to stop.

COLLECTION EQUIPMENT.

The ash and rubbish wagons are considered fairly satisfactory, but if the loading height should be lowered one less loader in each gang would be needed for ash collection, and the work would be easier on the men. In studying the collection equipment, the investigators considered that vehicles used in this work should be chosen with a view to obtaining:

1. Economical size and ease of operation.
2. Convenient loading height.
3. Proper construction of body.
4. Convenient and sufficient cover for loads.
5. Convenience in unloading.
6. Ease of cleaning.
7. Economy in locomotion.
8. Durable construction.

The size of vehicle is controlled by the unit weight of the material collected, the grades and types of pavement over which it is to be used, and the tractive power. Within the limits set by these conditions, care should be taken that the size of load is adjusted to the hours of work, i.e., a wagon carrying two tons of refuse per load and collecting three loads a day will prove more economical than one carrying two and a half tons per load and collecting but two loads per day.

Collection vehicles should not be so large as to prevent easy handling in traffic or on narrow streets. The loading height, especially for ash wagons, is an important feature. The edge of the box should be as near the ground as is consistent with good-size loads. It is recommended that the loading height of the ash wagons in Rochester be reduced to four feet six inches. The top of the box of the wagon used in garbage collection is five feet nine inches from the ground, which should be reduced to not over five feet by using a drop axle, smaller rear wheels, or by changing dimensions of the box.

The garbage wagon consists of a steel tank hinged near the back axle and kept in place by a coupling device; which device is so loose that the tank body bangs and shakes when the wagon passes over the rough pavements, thus wearing out the wagon and making much undesirable noise. The box is too small to hold eight hours' collection in one load and too large to be filled twice by a day's collection. If the capacity were increased to four cubic yards, the collector would be able to work for a full eight hours without making a trip to the reduction plant during that time.

The bodies of all types of collection vehicles should be sufficiently tight to prevent leakage of refuse and should be provided with covers adequate to prevent scattering from the tops of the loads. The loose canvas covers used in Rochester do not entirely meet the requirement, and a better device should be looked for. The investigators suggest canvas covers supported on bows for ash and rubbish wagons.

All vehicles should be designed to unload quickly and easily, and also be cleaned easily, especially those used in garbage collection. The decay of material incrusted on garbage wagons is responsible for most of the odor prevalent about them.

It is recommended that for collecting rubbish, specially built boxes holding ten to twelve cubic yards be built for use on sleighs during those winter months when there is too much snow on the ground for wagons, the boxes being removable and interchangeable. Boxes are now used in Rochester of only half this capacity and are inconvenient to unload.

It is recommended that the hand trucks used in handling ash and rubbish receptacles be provided with a 12-inch instead of 8-inch wheels, and that hard rubber tires be given a trial for reducing the noise and danger of breakage.

Rubbish Bags.—It is recommended that burlap bags be used for collecting rubbish, this having been practised with success in various places. In estimating on the cost of this, it was found that during 1916, before war-time conditions had affected production, 149,304 cubic yards of rubbish were collected, of which 123,053 were collected outside the business district. The average cost of labor and teams employed in collecting was 48.8 cents per cubic yard. In the residential district, where the use of bags would be most feasible, the average production amounted to about one and a half cubic feet per stop per week, the average rising to 2.1 cubic feet during the months of maximum collections. Using ordinary burlap bags having a capacity of three cubic feet or more, probably 75 per cent of the residential stops could be served by one bag per week and the rest by two bags per week. About 55,000 bags therefore would be required to serve the

A LOADING HEIGHT SIX INCHES LESS WOULD MAKE EASIER WORK OF ASH COLLECTION.

UNNECESSARILY HARD WORK IN LOADING A GARBAGE WAGON.

residential parts of the city during the period of maximum production. To provide a sufficient surplus for replacement of full bags by empty ones in the process of collection, about one-fifth as many extra bags would be needed, or a total of 66,000. Bags used for this purpose are found to have an average life of about one year. On the above basis, contents of 260 bags could be carried by a 16-cubic yard wagon, and four men and two teams could collect from about 1,800 stops a day. It is estimated that one foreman and ten men would be necessary at the disposal plant to empty and stack the bags brought in. Taking the cost of teams at $4.60 a day and of men at $1.95 (the prices in 1916), the cost of collection by bags comes to $20,400 a year, cost of unloading and emptying the bags to $6,930, and cost of the bags themselves at 12 cents each, $7,920; giving a total cost of this service of $35,250. This would apparently show a saving of $8,800 a year over the present system. In addition, there would be other benefits such as profit from reclaiming much rubbish now hauled to the ash dumps and greater neatness in making collections and less nuisance at the dumps.

Municipal Ownership of Teams and Wagons. The cost of hauling is approximately half the total cost of refuse collecting, and the hauling service is therefore of primary importance. In the report is considered the relative desirability of municipal and contract collection, also the use of horse-drawn and automobile vehicles. At present in Rochester teams for ash collection are paid at the rate of $1.10 to $1.35 per load, the rate depending upon the average length of haul to the dump. Special pick-up teams are paid at the rate of 75 cents an hour, as are also teams employed in the rubbish collection. The teams and equipment used in garbage collection are owned by the city, having been purchased from the reduction company, as previously stated.

"Payment for hauling on the unit basis as practised in ash collection work is undoubtedly the most practicable method that can be employed in dealing with the large number of teams necessary, so long as teams are hired. But it has several decided disadvantages.

"In the first place, although an attempt is made to equalize earnings by regulating rates of pay for various lengths of haul, the amounts earned by teams in different parts of the city vary considerably. Even though every attempt is made to treat all team owners justly and impartially, some unfairness is bound to exist." In order to treat all teams with fairness it is necessary to employ the same ones continuously on the same routes, balancing a long haul on certain days with a short haul on other days. This results in loaders being in idleness part of the time on long-haul days, and hurrying wagons away with small loads on short-haul days, when one or more wagons are constantly waiting to be loaded. In either case, the result is increased cost in labor on the one hand and in hauling on the other. Much more economy could be secured by laying out routes and assigning teams and men according to the length of haul and volume of work.

The flat rate of pay per team-hour has certain advantages, but on account of inability to provide close supervision of teamsters, this method would put shirking at a premium and the resulting costs might be even higher than with the other method.

The only solution of the problem seems to be either municipal ownership and operation of the teams and equipment, or motorized equipment. The final determining factor depends in the last analysis on the relative economy of these two possibilities in meeting local requirements.

Horse-Drawn or Motor Equipment. In endeavoring to make such a comparison, it is necessary to know the cost of upkeep of the collection force. A few cities own the teams and collection equipment used in this kind of work, but of these only one or two have any complete data with regard to the cost of stable operation. The operating cost of motor vehicles is even more difficult to determine, as no large city has more than a part of its collection service motorized, and even this partial motorization has been so recent that there are scarcely any published data regarding costs.

Using such figures as are obtainable, it is concluded that charges against the service would consist of five per cent interest on the cost of horses and equipment, an annual depreciation of $35.33 per year per horse and $20 per refuse and ash wagon. Feed, stable supplies and stable labor are estimated at $336.65 per horse per year and repairs to wagons at $25 each. Wages of drivers are estimated at $8.40 a year. This gives an average cost of $875 per horse per year, exclusive of cost of sites or stable buildings. On the basis of 310 working days a year, this gives about $2.83 per horse per working day, or $5.66 per team. (The city paid $6 per day for hired teams.) If the calculation is correct, there would be a saving in cost annually of a little less than $5,000, which saving capitalized would more than suffice for purchasing the necessary stables and stable sites.

(To be continued.)

STRESSES IN CONCRETE ROADS.

Experiments Made by the Bureau of Public Roads Possibly Explain Reasons for Many Cases of Cracking and Failure.

Decision as to the proper thickness of a concrete road is now a matter of judgment and precedent rather than of science. There is no definite knowledge concerning the stresses that take place in a concrete slab resting upon more or less yielding soils when loads are applied to it, nor the action of the slab under given stresses.

Early in 1919 an investigation of pressures and stresses in concrete slabs was made at Camp Humphreys, Virginia, by A. T. Goldbeck, engineer of tests of the Bureau of Public Roads, with the co-operation and aid of Major Guy Withers, W. E. Rosengarten, J. R. Boyd, W. H. Barton and others. From a description of Mr. Goldbeck in the official publication of the Bureau we abstract a description of the tests and quote in full the conclusions.

The concrete road where the test was made is of 1:1½:3 gravel concrete, having a crushing strength, as determined by 6x12-inch cylinder, of 3,190 pounds per square inch. The road is 18 feet wide, 8 inches thick at the center and 6 at the sides. Four pressure-measuring instruments were set in the bottom of the slab, 2 ft. 6 in. and 8 ft. 9¼ in. respectively each side of the roadway center. The pressure exerted between slab and subgrade was indicated by air pressure acting, through a pipe laid in the subgrade, upon a delicate pressure gauge.

It was found that the reaction pressures under the slab with no superload were not uniform and varied from day to day, and were different after the passing of a heavy vehicle. In studying the pressures under heavy loads, an army truck loaded with 5 tons of sand was used, the axle loads being 5,000 pounds and 17,000 pounds respectively. In addition to special tests with this truck, measurements during four months were taken of the effect of lighter loads.

From these experiments, which he refers to as a "preliminary investigation," Mr. Goldbeck drew the following tentative conclusions:

"1. That a concrete road slab under the action of traffic or perhaps under the influence of frost and different percentages of moisture in the subgrade is continually bending, so that the reaction pressures between the subgrade and slab are neither constant nor uniform in intensity.

"2. The reaction pressures due to heavy wheel loads are a maximum directly under the loads and vanish to zero in a comparatively small radius, which partially depends upon the intensity of the load. A heavy wheel load is distributed over a larger radius than a light wheel load. For this particular subgrade, a load of 8,500 pounds has a radius of distribution of pressure of about 6 feet, most of the pressure, however, being exerted over a radius of about 4 feet.

"3. As the concrete slab recovers from its deflection after the passage of a load more readily than the soft subgrade, there is a tendency for the continual deflection of the slab to produce areas having very little or no bearing. If the traffic is concentrated at the center of the road, as it is on many concrete roads, the continual deflection tends to depress a soft subgrade away from the center of the slab, which would then be more largely supported at its sides. In extreme instances this might account for some longitudinal cracking in concrete roads.

"4. As nearly as can be estimated from the results of this test, the tensile stress in an 8-inch concrete slab directly under an 8,500 pound wheel load at rest on the road is only 34 pounds per square inch when the slab is well supported on the subgrade. As the modulus of rupture of 1:1½:3 concrete is about 600 pounds per square inch, it is seen that this pavement should be able to withstand considerable impact before cracking. Should the concrete arch over very soft spots, so that there is no support directly under the load, the tensile stress may become very high. Such a condition arises when the sides of the slab are raised by frost action or possibly when the subgrade is worked any from under the slab by continual deflection.

"5. It is probable that the tensile stress which results in the slab directly under heavy wheel loads is never very great as long as the slab rests on the subgrade and it is unlikely that the slab design would ever be controlled by this stress.

"It must be emphasized that the present investigation has to do merely with the question of cracking of concrete road slabs under static loads, and this is only one phase of the determination of the thickness of concrete roads. The preceding calculations consider the slab in the same light as a bridge structure, in which cracking would be absolutely fatal. The cracking of a road slab, on the other hand, does not necessarily impair its usefulness, assuming proper maintenance, and in fact no matter how thick the slab is made, transverse shrinkage cracks are bound to occur.

"When the cracks in a slab become so frequent that there is danger of complete disintegration or of the formation of depressions, the slab can be considered as having failed. It is hard to believe that such a failure could occur in any manner except by impact, and the present preliminary investigation serves but to emphasize that fact. A complete investigation of the determination of slab thickness must therefore include impact effect, and plans are now under way for making suitable impact tests."

SUGGESTIONS FOR CONCRETE PAVEMENT CONSTRUCTION

Conclusion of Article Begun in June 14th Issue—Belt Finishing and Curing Pavements and General Precautions.

Belt Finishing.—For finishing the pavement, a 10 or 12-inch canvas or rubber belt is used. This should be about three-eighths of an inch thick, at least 2 feet longer than the pavement is wide, and have wooden handles bolted to each end (see Fig. 2). The following method produces very satisfactory results. The pavement is first gone over with the belt, using a sweeping stroke 18 inches in length with a longitudinal advance at each stroke of from 4 to 6 inches. On the return trip a shorter, quick stroke about 8 inches in length is used, the advance being from 6 to 8 inches for each stroke. The third and final passage of the belt is performed by holding the belt down close to the side forms and advancing it rapidly over the surface with as little side movement as possible. After the belt finishing, the pavement should present a smooth, uniform surface.

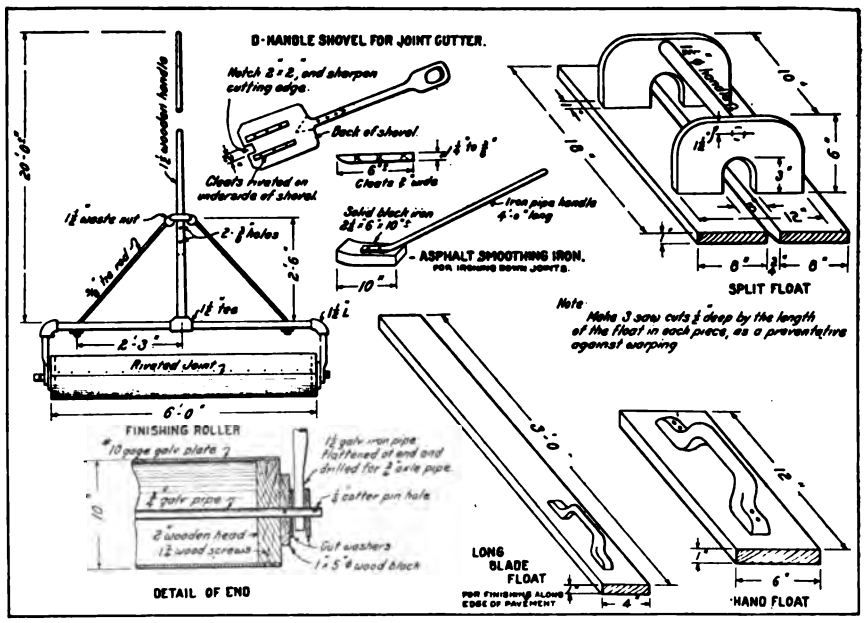

D-HANDLE SHOVEL FOR JOINT CUTTER.
Notch 2"x2", and sharpen cutting edge.
Back of shovel
Cleats riveted on underside of shovel.
Cleats 2" wide
Solid black iron 24"x6"x10"x¼"
Iron pipe handle 4'-0" long
ASPHALT SMOOTHING IRON.
FOR FINISHING EDGES OF JOINTS.
SPLIT FLOAT
Note
Make 3 saw cuts ¼ deep by the length of the float in each piece, as a preventative against warping
FINISHING ROLLER
10 gage galv. plate
2" galv. pipe
2" wooden head
12 wood screws
Cut washers 1'-5" wood block
DETAIL OF END
LONG BLADE FLOAT
FOR FINISHING ALONG EDGE OF PAVEMENT
HAND FLOAT

FIG. 3—TOOLS USED IN THE CONSTRUCTION OF CONCRETE PAVEMENTS.

Curing.—In curing concrete, two methods are in general use:

First, by covering the pavement with a layer of dirt from the shoulder materials, and keeping this wet down.

Second, by checking off the pavement by means of small earth dams and covering checks with small ponds of water.

The second method of curing is more positive, and should be used when sufficient water can be obtained. It has its disadvantages when used on grades and banked curves, but usually these can be overcome by building smaller size checks. Covering with dirt may be cheaper in most cases, but when clay or other adhesive material is used for covering, trouble is apt to be experienced in removing, especially if traffic gets onto the pavement while the covering is still in place. Furthermore, most contractors wish to remove an earth cover with blade

machines, by which method the asphalt strips at the joints are likely to be damaged.

Curing by ponding shows up the irregularities in the surface and in the setting of the side forms, which, while of no great value in correcting completed work, helps to determine what improvements should be made on work still to be done.

Canvas covers should be provided for at least a third of a maximum day's run in order to eliminate sun and wind checks; also as a provision against rain-washed surfaces. If a surface does become washed by rain, sprinkle it over with neat cement and pass the finishing belt over it two or three times.

When the average temperature is below 50 it is better to omit covering and ponding, and sprinkle the surface with water whenever it appears to be drying out.

General Precautions.—Look over the side forms every few days and note whether there are any with warps or deflections which should cause them to be thrown out. If there are, be sure to disfigure them enough so that they will not appear in the next day's run.

See that the contractor uses care in setting the side forms, and that they are held firmly to line and grade. Tamping with the strike board often results in settling them. Check the forms with a level every once in a while, as it has a very beneficial effect on the work of the form setter to know that his work is being checked.

Do not let the form setters use stones to hold the forms up to grade, but have the contractor provide them with blocks. A still more satisfactory method for setting forms is to drive stakes about every 8 feet and set the forms on them.

Count the cement sacks at the end of each block. This keeps every one informed as to the cement content of the pavement.

Have the contractor remove all cement sacks every night. If sacks are left on the work they are apt to be mixed with those from the next day's work.

In piling cement ahead of the mixer, have boards placed under any that will remain out over night.

Have a sufficient number of strong barricades to shut traffic off of the road, and have a sufficient number of red lanterns.

Detour signs should be provided, and care should be exercised to see that they are in place, especially at night. A traveler on a strange road at night requires a great deal of information as to the route he is trying to follow. This need should be met as fully as possible, for if it is not met, barricades will be broken down and valuable work may be damaged.

The local papers should be used freely to inform the public as to what parts of the road are closed and as to where detours must be made.

ILLINOIS STATE HIGHWAY DEPARTMENT.

Because of the enormous amount of highway construction to be begun this year by the State Highway Department of Illinois, an enlargement and reorganization of the department has been found necessary. The number of districts has been enlarged from seven to nine and the work of the Bureau of Bridges and Roads has been divided, construction work being assigned to a new Bureau of Construction and designing work to a new Bureau of Design. In the past most of the work has been in the line of designing, and most of the former officials are connected with the new Bureau of Design of which F. T. Sheets, bridge engineer, is made the head. B. H. Piepmeier, maintenance engineer, takes charge of the Bureau of Construction.

WATER WORKS CONVENTION.

Conclusion of Description of Proceedings—Private Fire Services—Question Box Discussion—Papers and Committee Reports.

PRIVATE FIRE PROTECTION SERVICES.

The report was apparently not the sole work of the chairman, N. S. Hill, but, as Mr. Hill stated, embodied the opinions of all the members; although the chairman had done most of the work of compilation and preparation of the report. The committee had "endeavored to make its findings accord, so far as possible, with the predominance of the opinions of the courts and commissions, feeling that in so doing the committee was following the line of least resistance and also that thereby the work of the waterworks men would be standardized to a great extent throughout the country."

Detector Meters.—J. N. Chester led the discussion by stating that he heartily commended the work of the committee and was in full accord with most of its report; but would like to see a few changes made. He would like to see eliminated everything that would offer anyone an excuse for not placing a detector meter on every private fire protection line, or for depending for protection upon frequent inspection. Not that he decried the necessity and value of inspection, "but we too frequently depend upon some other means than the detector meter, in which case we will be apt to find that the facts will not be known nor the proper results achieved." He did not believe in by-passing a meter and sealing the valve, for valves do not always stay sealed.

On this point F. E. Beck stated that in January, 1919, the Utica, N. Y., water company installed 19 detector meters, which registered leakage at the rate of $3,343 a year, one showing 5,700 cu. ft. a day. Mr. Chester cited an instance occurring within two months where a company declared that no water had been withdrawn from its fire protection line, but the meter showed that $80 worth of water had passed, and they believed the meter.

Size of Pipe.—There was considerable discussion of the matter of size of pipe for private fire lines, especially of the provision in the report that "no service connection with a capacity in excess of 50 per cent of the water main supplying it should be installed. All risks requiring more than 50 per cent of the main capacity should be required to provide a supplemental water supply by storing water in elevated tanks or the equivalent."

While this would be satisfactory for most cases of ordinary distribution mains, said Mr. Chester, he did not think it should be applied where a large main supply pipe passed the premises. The size should, he thought, be regulated by the size of the property protected or the appliances fed by the fire line—the number of spinkler heads, hydrants, standpipes, etc. He had known cases where a 6-inch pipe was demanded when a 3-inch would have been ample for all the sprinkler heads used.

Discussing this point, W. E. Miller, of Madison, Wis., a member of the committee, pointed out that if a street main 72 inches in diameter passed a factory, it could demand a 4-foot fire connection. But Frank C. Jordan, another member of the committee, called attention to the paragraph of the report reading: "The size of private fire service connections which should be permitted depends not alone upon the adequacy of the means provided for controlling them to prevent bleeding of the water system, but also upon the design and capacity of the water distribution system in the vicinity of the risk."

Commenting upon this, Mr. Jordan said: "In other words, to a large extent it is up to the common sense and the good judgment of the water department super-

intendent as to the size that he shall allow, and he must take into consideration his distribution system. It was never in the mind of the committee that a 24-inch or 18-inch connection should be allowed to any man because the force main happened to be in front of his property. Throughout this entire report Mr. Hill has dwelt very carefully on the integrity of the supply from the standpoint of its purity and the obligation to the general public, this being paramount to your obligation to the man who is seeking to patronize you for the private fire protection service." The 50 per cent was not given as a method of determining size, but as a limit beyond which no other consideration was to be permitted to carry the size.

Chester R. McFarland, of Tampa, Fla., thought the report could be improved by giving information to be used in designing size of fire lines, such as the number of fires per year in which sprinkler heads have opened; how many heads opened; the longest fire that has been controlled by sprinkler heads and by how many heads; in short, what percentage of sprinkler heads in any building have ever opened at any one time. The number of heads necessary to provide for is the controlling factor in the size of fire line needed.

Check Valves.—F. W. Cappelen, of Minneapolis, stated that as a member of the State Board of Health of Minneapolis he could not vote to adopt a recommendation of check valves where a private impure supply and the municipal supply were joined in the same plant; for his board prohibited connections of any sort whatsoever from an impure supply to a pure one. One establishment in Minneapolis had 18 cases of typhoid fever and 6 deaths in one month caused by such a connection. D. A. Reed, of Duluth, however, said that the state board could not enforce that ruling, and Duluth permits such connections if protected by the double-valve system recommended by the committee. "We cannot go through with the business affairs of this country looking at health only; if we did we would not do very much business. In an argument before the State Board of Health I presented to them the fact that the dual system as protected by the F-N check had never been known to fail in any one single instance. If there is any member here who can tell me any case where this system as recommended by this committee has failed or where any contamination or sickness has resulted from its use, I should be glad to get the information. I have written to every part of the United States and have not been able to find a single such instance."

Patrick Gear said: "The double valve well made is all right, but I have not seen a well made check valve yet." He thought the expense of large pit and double check was unwarranted because of the unsatisfactoriness of the check. He has invented a check valve that he thinks is all right and which he submitted the first of this mouth to the National Board of Fire Underwriters for their approval.

Charge for Private Fire Service.—The report ends with the recommendation that "Private fire hydrants shall be charged for at the same rates as public fire hydrants"; this and other rules to "be considered in conjunction with the establishment of a system of rates" developed in the preceding eight pages.

Several took exception to this. Mr. Chester called attention to the fact that in a number of cities the fire protection charge was based largely upon the mile-foot of pipe with a small or nominal charge for the fire hydrant itself; and to use the same plan for charging for a private hydrant would be unfair. Mr. Miller raised the point that many municipal plants receive no hydrant rental; and thought that the charge for private hydrants should include the hydrant and private fire line, covering interest, depreciation, and maintenance, as well as cost of inspecting the installation.

There was some objectiton to the idea of the committee that no charge be made for a private fire line from main to curb; especially in view of the fact that many or most cities charge for the entire length of a service connection, including tapping the main.

QUESTION BOX.

The remainder of the second session was devoted to the general propounding and answering by members of questions relative to maintenance practice.

Reservoir Leaks.—Replying to the question, "What is the best method to use in stopping leaks due to the bottom cracking in a reinforced concrete reservoir 150 feet in diameter, with 24 feet head?" D. A. Reed said that for stopping cracks they had had success in chiseling out a grove a half-inch wide and ¾ inch deep and caulking in hemp and asphalt. If the concrete is porous, he suggested one of the various waterproof coatings.

Electrolysis.—The longest discussion was brought out by the question: "Is it a common practice for electric light companies to ground their wires on water pipes, and, if so, does it cause trouble by electrolysis destroying the pipes?"

Homer C. Crawford said that there had been a number of cases of trouble from this in central Iowa caused by three-phase A. C. current. G. T. Maxon told of a pipe system and meter in a cellar totally destroyed by electrolysis.

R. B. Howell said that in Omaha there had been considerable trouble with electrolysis of mains, and the Bureau of Standards had been requested to send a representative; as a result of which the telephone, electric light and street railway companies and the gas company and water district got together and paid for an electrolysis survey by the Bureau of Standards, the recommendations of which have been complied with by the various companies. The street railway company was required to make changes in certain of its stations, involving considerable expense. A permanent board was formed of representatives of the interested parties named above, and tests are made periodically. Mr. Howell is not fully satisfied that all electrolysis has ceased, but they are having much less trouble. The cost of this and another report by the bureau was between $1,500 and $2,000, and the maintenance of the permanent committee costs $25 or $30 a month. As for damages, they have settled one claim against the street railway company by accepting half the cost of restoring the pipe line.

F. T. Kemble reported a representative of the Bureau of Standards as stating that alternating current would not cause trouble to amount to anything in a hundred years.

Pumping with Service Water.—W. W. Brush asked whether there was any plant where the head of water in one system of service mains was used, through a turbine, to pump water from another system with lower head, the water from both systems being delivered at once, mingled, into a common main. New York City is considering using the surplus head of the Catskill supply for giving more head to the old Croton supply, so that both could be combined in a single supply with a head intermediate between the two. No similar arrangement was reported by the members, although W. S. Cramer thought there had been such an installation in New England.

Removing Iron.—F. J. Connor, of Sioux Falls, wished to learn how to remove iron from water drawn from

wells 32 feet deep. The water is pumped to a 1,200,000-gallon reservoir, and some iron settles out, but considerable is deposited in the pipes. W. W. Brush reported that New York treats successfully a water carrying 10 to 12 p. p. m. of iron by aeration, applying a coagulant and rapid filtration. J. C. Habermeyer reported that at Champaign, Ill., trouble continued after rapid filtration had been adopted, but had finally been eliminated by aeration and liquid chlorine before filtration.

Inspection of Fire Hydrants. David L. Webster, of Brantford, Ont., asked concerning the practice of inspecting fire hydrants in freezing weather; stating that his city inspected theirs at least once a week, or twice in the business sections. F. J. Connor said that in Sioux Falls hydrants in the business sections were inspected once a week, one man being responsible for their maintenance and having a sufficient force of inspectors. In addition to the regular inspection, an inspection is made of each hydrant immediately after use by the sewer or fire department (which use the department is expected to report). If any hydrant will not drip, a little salt or wood alcohol is used.

R. W. Roper said that East Orange, N. J., had found regular inspection at least once a year was necessary. Also, his city provided a fine of $50 for any one except sewer or fire department employe opening a hydrant without permission; and employes of these departments must report every time they open a hydrant. During the past five years four men have been fined $50 each.

It was suggested that considerable information on the subject would be given later by the committee on "Cold Weather Troubles," but this report, presented at a later session, was one of "progress" only.

Cleaning Service Pipe. On Wednesday morning the question was discussed: "What is the best means of cleaning out service pipe that has been partly closed by iron or any other substance deposited by the water?" F. J. Connor said that in Sioux Falls they used a thawing outfit for steaming out the services that gives fairly good results. Also a hand-pump with wads of tissue or toilet paper (described in Municipal Journal and Public Works some months ago). He cautioned against getting the pipes too hot, when using steam, and destroying the fibre washers in corporations or flange unions.

Thursday Evening Session.

Papers were read by Henry F. Wagner on "The Buffalo Water Supply, with Special Reference to the Filtration Problem," by George C. Andrews on "Reduction of Water Consumption by Means of Pitometer Survey and Constant Inspection," by D. A. Decrow, of the Worthington Pump and Machinery Corporation, on "The Uniflow Pumping Engine," and John Oliphant's paper on "Air Lift and Water Purification" was read by C. C. Cummings, of the Sullivan Machinery Company, in the absence of the author because of injury. The first three were illustrated by lantern slides. There was practically no discussion of any of them.

Wednesday Morning Session.

A paper on "The Relation of the Chemical Industry of Niagara Falls to the Water Works," by John A. Kienle, dealt chiefly with the use of chlorine for water sterilization. It was discussed by George A. Johnson, who briefly referred to the history of its introduction, and said "the ideal method of water treatment is, first, complete clarification by filtration, followed by sterilization with chlorine; and that, I think, is what American municipalities are coming to today—it is at least what they should all come to." Chlorination alone is not as desirable as filtration alone, unless the water is free from suspended matters. Combined, they give 100% protection. M. N. Baker said that "Water works men have nothing upon which they can more justly congratulate themselves than this reduction in the typhoid death rate, in which they have played so important a part in the last few years."

Milwaukee's experience with tastes attributed to chlorine was narrated by Henry P. Bohmann. Investigation, however, revealed that the taste was due to sewage discharged from a coke plant, and the waste water from a phenol plant located 13 miles from the water works intake, where it was found that 2,200 pounds of phenol was escaping daily, which polluted the whole lake. With the signing of the armistice the phenol plant was closed down, and the coke plant sewage was diverted.

It was stated by Maurice A. Scharff that in France the use of chlorine for water sterilization was unknown or at least unnoted until introduced by our army; Lieut. Col. Edward Bartow having proved to the French sanitarians that Seine river water could be made bacteriologically safe in this way. As a result, chlorine was used for the supplies at La Rochelle, Brest and other cities.

Trend of Prices.—Papers on this subject were contributed by D. J. O'Brien, of the A. P. Smith Mfg. Co.; Paul E. Ivey, of the American Cast Iron Pipe Co.; an unknown author, president of a large cement company; the editor of Iron Age, and H. E. Buttenheim, of the American City. The general tenor was that prices were up to stay, for a long time at least, because war financing had lowered the purchasing price of money and because of the scarcity of labor.

Following this came the adoption of the amendments to the constitution already given, the reports of the secretary and treasurer, of the Publication Committee, of the Finance Committee and of the Membership Committee.

Electrolysis.—The report of the delegation representing the association on the American Electrolysis Committee was read by Edward E. Minor, in the absence of the chairman Alfred D. Flynn.

Before the war the committee, which represents eight organizations, including the street railway interests, got together and prepared a statement covering the problem of electrolysis and agreed on definitions, principles and theories. The Bureau of Standards suggested that the work of this committee might be carried out through it, but the committee does not abandon its right to criticise the bureau or disagree with it on any point.

While the other interests on the committee—the telephone, gas, lead cable, etc.—have expert electrical engineers whose whole time is given to this subject, the water works association has not, and the committee thought it desirable that it should have. It believed that the money for the expert need not come from the society but could be raised in other ways. Mr. Minor suggested for this purpose the expert who represents the Gas Institute on the committee.

Mr. Metcalf, speaking for the Executive Committee, said that in the matter of electrolysis a very important legal question was involved, and the association should be very careful lest it prejudice the interests of water works properties. The employment of an expert seemed to be an excellent idea, but the Executive Committee thought it wiser to wait a little and see what line of investigation the Bureau of Standards might take up. He therefore moved that the report of the committee be received, the committee be continued, and the vacancy on it be filled by the Executive Committee, that committee to take under advisement the suggestion that an expert be appointed to the vacancy to aid in future

investigations. G. T. Maxon, of Cortland, N. Y., said that his company would be willing to pay its part of the expense of such expert. This motion was carried.

The president read a letter from Edward Bartow, giving a list of 178 members of the sanitary corps and quartermaster's department engaged in the water supply service of the American army in France, who he thought should join the Association. Following the reading of this letter, Leonard Metcalf submitted a resolution:

"That a committee be appointed to arrange for a meeting of the officers and men of the Sanitary Corps engaged in the Water Supply Service of the American Expeditionary Forces in France, of the Engineer Corps at home and abroad, and of the Water Supply Branch of the Quartermaster and Construction Corps of the United States, with a view to inviting them to become members of this association and to attend its next annual convention." This was carried, and later the president-elect announced the appointment of Messrs. Maury, Bartow and Henderson.

The nomination of members of the Nominating Committee was then taken up, with the result already given.

Selection of a place of meeting for the next convention was preceded by the reading by the secretary of general invitations from Asbury Park, Atlantic City, Columbus, O., Detroit, Kansas City, Mo., Philadelphia, Saratoga Springs, San Francisco, Tampa, and Washington, D. C. Representatives spoke for Tampa and Detroit. The Convention Committee suggested Montreal, which received 62 votes out of 121, Detroit coming second with 29 and Tampa third with 12.

Thursday Morning Session.

The committee on Revision of Standard Specifications for Cast Iron Pipe and Specials reported that it had no report to make, but with the return of normal conditions hopes to make a report next year. Committee continued.

The secretary read the report of the committee on Standard Form of Contract, and a report of progress by the committee on Official Standards of Water Analysis. Both committees were continued.

A paper entitled "The Water Distribution Systems of Industrial Housing Projects for Ship Builders" was read by Wm. H. C. Ramsey, illustrated by lantern slides. Following this "Water Supply for the Cantonments and Other Construction Division Activities" was read by Lieut. Col. Dabney H. Maury, which elicited from president Henderson the remark that "He has crowded into exactly one hour a paper which deserved and should be given two hours."

John M. Goodell then introduced Lieut. Col. Scheiden-

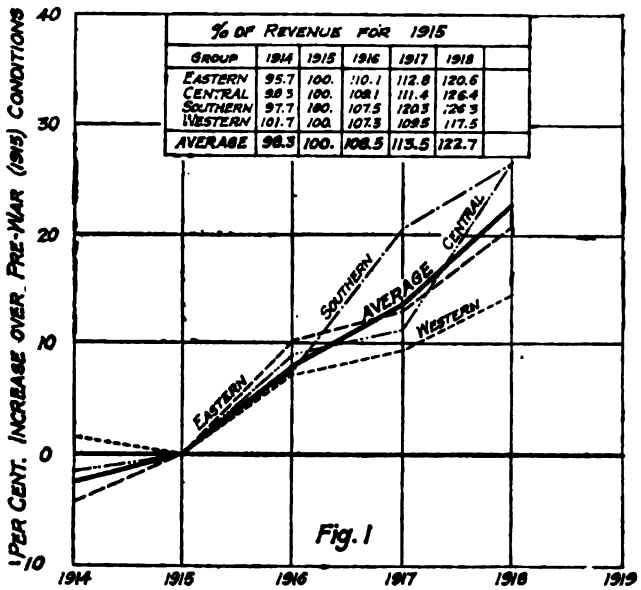


Fig. 1—Gross Annual Revenue.

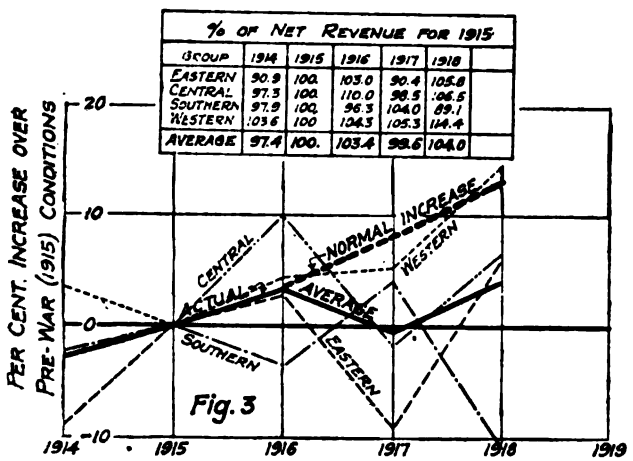


Fig. 3—Net Revenue; Applicable to Depreciation, Interest, Dividends and Surplus.

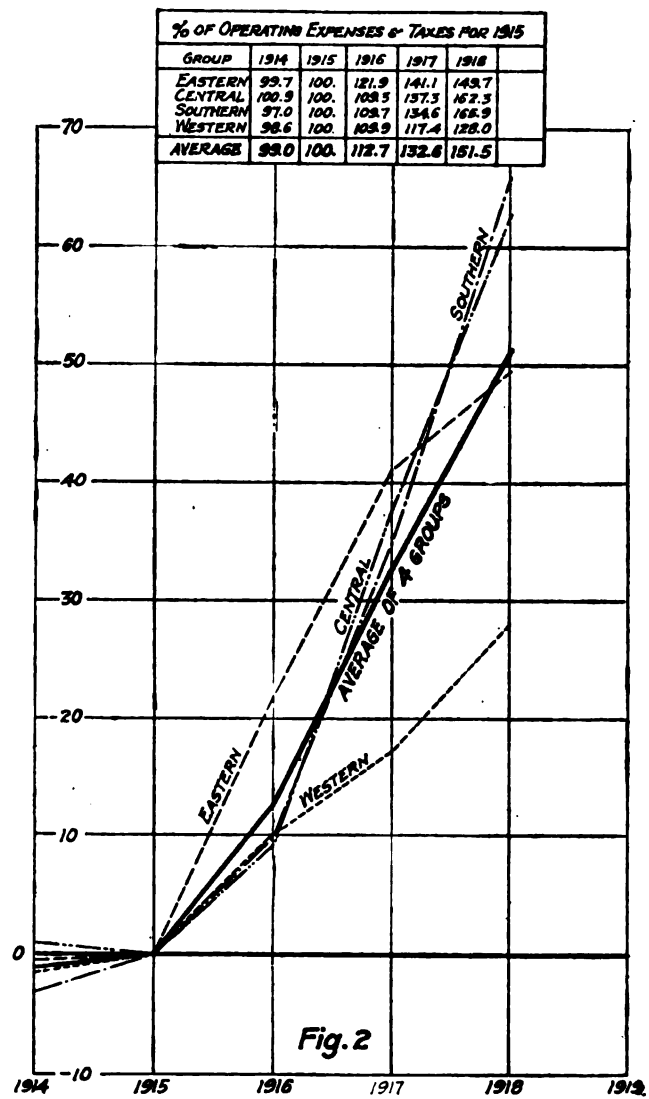


Fig. 2—Operating Expenses, Including Taxes.

EFFECT OF WAR BURDENS UPON THE REVENUES AND EXPENSES OF WATER WORKS IN THE UNITED STATES TO DECEMBER 31, 1918; AS SHOWN BY RECORDS OF ABOUT 50 PLANTS.

heim who described how the First Army Corps in France was supplied with water, illustrating his talk with numerous lantern slides.

Friday Morning Session.

The last session opened with a paper by Harry Y. Carson, formerly captain and sanitary engineer, American Red Cross Commission to Palestine, now with the American Cast Iron Pipe Co., on "Some Water Supply Problems in Palestine," with many lantern slide illustrations. Only about twenty were present, but these found the paper so enjoyable that they gave Mr. Carson a rising vote of thanks.

A paper entitled "Flat Rates vs. Meters" was read by C. E. Abbott, of Tuscaloosa, Ala., in which he made a comparison of operation under the two.

A paper by Capt. Lucius A. Fritze, water supply officer of the Rainbow Division, entitled "Water Supply Service in the Army of Occupation in Germany" was read by title.

Adjourned.

THE WAR AND THE WATER WORKS.

Tables and Diagrams Presenting Data Referred to in the Discussion of This Subject Last Week.

Last week we printed the paper presented by Leonard Metcalf before the American Water Works Association in which he discussed the effect of the war upon water works finances. The tables and diagrams by which he showed in concise form the data upon which many of his conclusions were based were omitted for lack of space, and are given herewith, together with notes explanatory thereof.

The figures 1, 2 and 3 reproduced herewith* show the effect of war burdens upon the revenues and expenses of about 50 typical water works in the United States in the period from 1914 to 1918, both inclusive. The relative percentages of the records of each year are shown with reference to the pre-war conditions, which existed in the United States up to or slightly later than the end of the year 1915, assembled in four groups characterized as the Eastern, the Central, the Southern and the Western groups of water works, the group percentages being subsequently averaged, to determine the general conditions prevailing over the country.

Cost of Unskilled Labor and Materials.—The relative increase in cost of labor and materials, to the typical water works in the United States previously referred to, is shown in Table 1. It contains the basic information reported in Table 10 of the 1918 report of the Committee on War Burdens in the United States, brought down to date, December 31, 1918, by the writer, through the friendly assistance of the managers of the plants reporting, regardless of public or private ownership.

In the diagram Fig. 4 the author has arranged the data as to unskilled labor costs by geographical groups.

*See page 471.

UNSKILLED LABOR COSTS.

From data reported to Executive Committee of the American Water Works Association in May, 1918; with additions to December 31 by Metcalf.

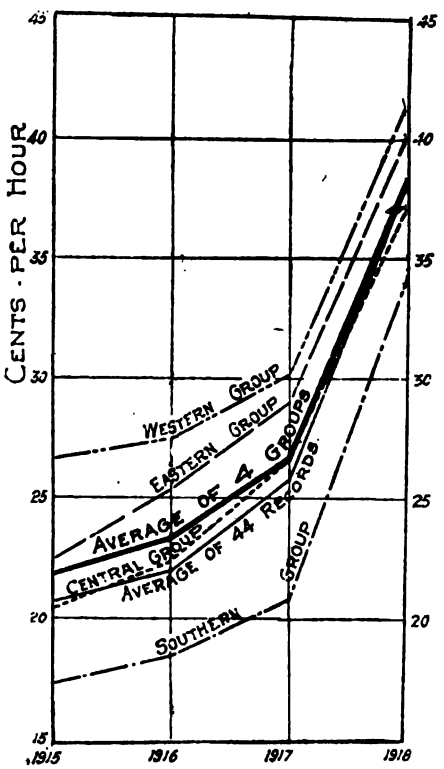


Fig. 4—Yearly Average by Groups in Cents Per Hour Paid by Water Works in United States.

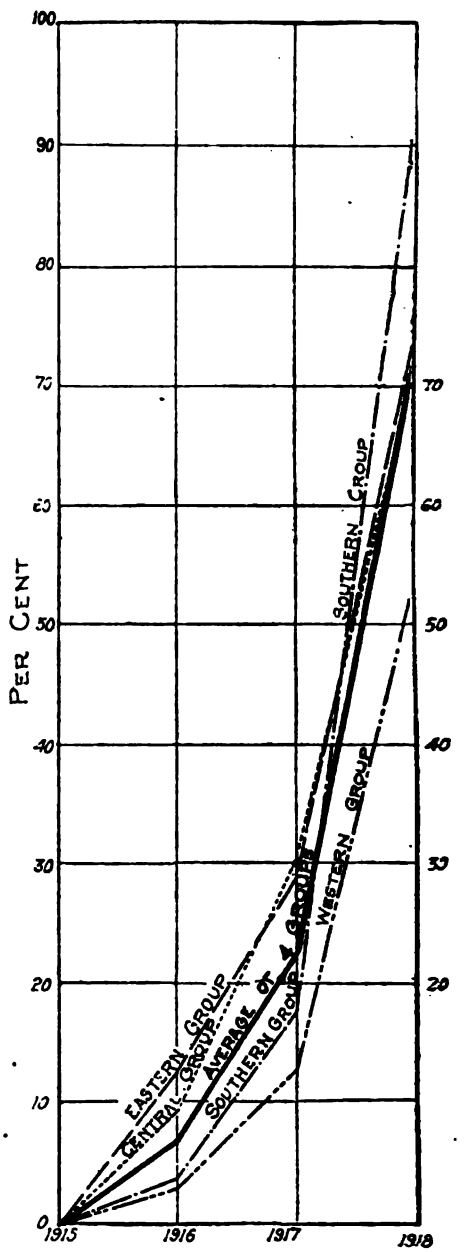


Fig. 5—Per Cent of Increase Over 1915 Wages Paid by Water Works in United States.

In connection with these data attention is called to the fact that "It was generally reported that there has been also a marked decrease in efficiency of labor since the year 1914, variously estimated at between 20 per cent and 50 per cent; and that the increase in wages paid to labor by water works had not kept pace with contract prices, owing probably to the advantage of continuity of service."

Given in tabular form, the figures from which this diagram was prepared were as follows:

Average Unskilled Labor Costs Paid by U. S. Water Works in Cents Per Hour

	1915	1916	1917	1918
7. Western group	20.64	27.45	30.05	41.6
15. Eastern group	22.43	25.28	28.95	40.2
12. Central group	20.39	22.29	26.52	37.2
10. Southern Group	17.67	18.35	20.85	34.3
Average of 44 records	20.6	22.0	25.7	38.3
Average of 4 group averages.	21.8c	23.3c	26.6c	38.3c

The data compared in another way are shown in Fig. 5,

TABLE NO. I. SUMMARY OF DATA UPON INCREASE IN COST OF LABOR AND MATERIALS TO WATER WORKS IN THE UNITED STATES, AS REPORTED TO THE EXECUTIVE COMMITTEE OF THE AMERICAN WATER WORKS ASSOCIATION, MAY, 1918.
(Revised April, 1919, by Metcalf.)

No.	Item.	Number of Records	Prices Per Unit. 1915.	1916.	1917.	8 mos. 1918.	Per Cent Increase Over 1915. 1916.	1917.	8 mos. 1918.	Year 1918. Assembled by Metcalf. No. of Records	Unit Price,	Per Cent Increase Over 1915.
1.	Unskilled Labor* — in cents per hour:		Cents.	Cents.	Cents.		%	%	%		Cents.	
	(a) Western Group	7	27.0	28.5	31.4	Still	5	16	Still	8	41.8	54.7
	(b) Central Group	12	21.7	25.3	26.9	increasing	17	24	increasing	10	37.2	71.3
	(c) Eastern Group	15	23.0	26.7	30.4	in	16	32	in	18	40.2	74.7
	(d) Southern Group	10	17.9	20.6	24.5	all	15	37	all	12	34.3	91.6
	(e) Average of Groups (4).	..	22.4	25.3	28.3	groups	13	27	groups	4	38.4	71.2
	(f) Average of all	44	22.1	25.2	28.3		14	28		48	38.4	73.2
2.	Cast Iron Pipe, per 2,000 lbs.	21	$24.23	$30.70	$51.60	.....	26.7	112.9	.....	..	$67.74	179.0
3.	6-inch Valves	11	11.18	12.64	19.13	23.20	13.1	71.1	107.6	23	19.13	71.0
4.	12-inch Valves	3	34.78	41.53	65.22	69.00	19.4	87.6	98.7	10	65.02	87.0
5.	Two-way Hydrants	6	26.69	32.04	43.13	53.90	20.1	61.6	102.0	38	5.80	94.0
6.	Coal, per 2,000 lbs.:											
	(a) Eastern Group	13	2.98	3.80	5.96	7.04	27.5	100.0	136.3	16	6.00	101.0
	(b) Central Group	11	2.41	2.77	3.75	6.38	14.9	56.4	164.7	10	4.53	88.0
	(c) Southern Group	12	1.92	2.01	3.03	4.02	4.7	57.8	109.4	10	3.89	102.0
	(d) Western Group	5	3.97	4.37	6.31	7.89	10.1	58.9	98.7	6	7.92	99.0
	(e) Average of Groups (4).	..	2.82	3.24	4.77	6.33	14.9	69.2	124.4	4.	5.57	97.0
	(f) Average of all	41	2.62	3.04	4.52	5.69	15.3	73.7	117.1	42	5.42	107.0
7.	Fuel Oil, cents per gal., South	1	1.80	1.80	2.00	4.50	0.0	11.1	150.0	1	4.28	138.0
	Fuel Oil, cents per gal., West	1	1.38	1.50	2.57	3.55	8.7	86.2	157.3	4	4.05	193.0
8.	Alum, cents per lb.:											
	(a) Western Group	2	1.14	1.21	1.51	....	6.1	41.4	.....	3	1.53	34.0
	(b) Central Group	5	0.91	0.91	1.25	....	0.0	37.0	.....	6	1.50	65.0
	(c) Eastern Group	9	1.12	1.72	1.48	....	54.0	32.7	.....	8	1.45	29.0
	(d) Southern Group	9	1.08	1.38	1.48	....	28.0	37.0	.....	9	1.78	65.0
	(e) Average of Groups (4).	..	1.06	1.30	1.43	....	23.3	35.1	.....	4	1.56	47.0
	(f) Average of all	25	1.07	1.40	1.44	....	30.6	34.4	.....	27	1.59	49.0
	(g) New York Market Price†	Aver of Monthly Prices	2.08	4.63	3.57	5 mos. 3.15	123.0	71.6	51.4	..	.....	....

*NOTE.—It was generally reported that there has been also a marked decrease in efficiency of labor since the year 1914, variously estimated at between 20% and 50%; and that the increase in wages paid to labor by water work had not kept pace with contract prices, owing probably to the advantage of continuity of service.

†See Journal of Industrial and Engineering Chemistry.—Note that 1915 price was an advance of 34% over the 1914 average price before the advances listed went into effect.

where is given for each year and group the percentage of increase of unskilled labor costs over those of 1915. The figures themselves are:

from approximately 41c. per hour, as reported by the writer under date September 14, 1918, to approximately 46c. per hour in April, 1919, with allowance for the effect

	Cents per Hour 1915	1916	1917	1918	Per Cent of Increase 1915	1916	1917	1918
7. Western group	0	3.0	12.8	54.7	26.64	27.45	30.05	41.8
15. Eastern group	0	12.6	29.0	74.7	22.43	25.28	28.95	40.2
12. Central group	0	9.4	30.2	71.3	20.39	22.29	26.52	37.2
10. Southern group	0	3.8	17.8	91.6	17.67	18.35	20.85	34.3
44 Average of 4 groups	0	7.2%	22.5%	73.1%	21.8c	23.3c	26.6c	38.4c

Recent Data Upon Labor Prices of April, 1919, Paid by Water Works in the Vicinity of Boston.—It is interesting to note that in spite of the general business uncertainty and resulting depression, wages paid to unskilled labor by water works in the vicinity of Boston have advanced of vacations and holidays under pay granted by some works, as shown by the following tabulation; and present (June, 1919) conditions give little if any indication of reduction in prices this year, or hope for any marked reduction in the future.

TABLE II. LABOR PRICES PAID BY WATER WORKS IN THE VICINITY OF BOSTON—APRIL, 1919.

Place.	Common Labor. Per Day.	Per Hour.	Pipe Layers and Caulkers. Per Day.	Per Hour.	Hours Per Week.	Holidays.	Vacation, 2 Weeks Paid.
1. Boston	$3.04	$0.41	$3.25-$3.50	$0.444-$0.478	44	Not paid	Yes
2. Somerville	3.25	0.443	3.35	0.456	44	Not paid	Yes
3. Newton	3.25	0.443	3.50	0.477	44	Not paid	No
4. Lexington	3.25	0.406	3.50	0.437	48	Not paid	No
5. Waltham	3.25	0.443	3.50- 4.50	0.477- 0.613	44	Not paid	Yes
6. Everett*	3.75	0.511	4.25- 4.50	0.579- 0.613	44	Paid	Yes
7. Malden	3.50	0.477	4.00	0.543	44	Half-time	Yes
8. Chelsea	3.25	0.406	3.75	0.468	48	Paid	Yes
9. Quincy†	4.00	0.543	4.50	0.613	44	Paid	Yes
10. Medford	3.50	0.477	3.75	0.511	44	Paid	Yes
11. Melrose	3.50	0.477	4.00	0.543	44	Paid	Yes
12. Revere	3.50	0.477	3.75	0.511	44	Paid	Yes
13. Watertown**	3.50	0.477	3.75	0.511	44	....	....
14. Arlington	3.75	0.511	4.25	0.579	44	Six out of ten	Yes
15. Milton	3.50	0.477	3.93	0.535	44	Paid	Yes
16. Winthrop	3.50	0.437	3.75	0.468	48	Paid	Yes
17. Cambridge	3.50	0.477	3.75- 4.00	0.511- 0.543	44	Paid	Yes
18. Brookline	3.50	0.477	4.17	0.568	44	Paid	Yes
19. Marlboro	3.50	0.437	3.75	0.468	48	Not paid	No
20. Hudson	3.50	0.437	3.75	0.468	48	Not paid	No
21. Fitchburg	3.36 3.60 3.92	0.42 0.45 0.49			48	Not paid	Yes

Average, 46.1c

Sixteen allow two weeks' vacation; eleven pay for holidays; fifteen allow Saturday half holiday under full pay.

*In Highway Dept. $3.50-47.7c per hour.

†High account Government activities.

**$.50 bonus per day for those who work one year.

NEWS OF THE SOCIETIES

Aug. 26-28.—LEAGUE OF CITIES OF THE THIRD CLASS IN PENNSYLVANIA. Twentieth annual convention, Allentown, Pa. Secretary, Fred H. Gates, city clerk, Wilkes-Barre, Pa.

Aug. 27-29.—VIRGINIA STATE FIREMEN'S ASSOCIATION. Thirty-third annual meeting, Charlottesville, Va. Secretary, E. K. Landis.

Oct. 27-30.—AMERICAN PUBLIC HEALTH ASSOCIATION. Annual meeting, New Orleans, La. Secretary, A. W. Hedrich, 169 Massachusetts ave., Boston, Mass.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Springfield, Ill.

American Society of Civil Engineers.

After being omitted for two years because of the war, the annual convention of the American Society of Civil Engineers was held again—this time in Minneapolis and St. Paul, June 17.

The association was welcomed by Governor Burnquist, and then President Fayette S. Curtis, of the association, delivered his presidential address. He recalled the duties of the civil engineer and considered the training necessary for success in this field. He emphasized the value of solving physical problems rather than studying dead languages. He said that the growth of the republic depends on the work of the engineer and enlarged upon the future and its opportunities for engineering. F. C. Shenehon gave an interesting talk on some engineering activities in the Twin Cities.

The afternoon session brought out vital discussion on the report of the Committee on Development, which was based on the work of four sub-committees appointed at the November meeting. The main sub-divisions of the report represent approximately the scope of the sub-committee work. Parts of the report follow:

A. Relations with Other National Societies and Relation Organizations.

It is the opinion of your committee that the identity of the four existing national societies should be preserved. The committee believes that the American Society of Civil Engineers should continue to pursue the objects for which it was formed as expressed in the constitution, namely, "the advancement of engineering knowledge and practice and the maintenance of a high professional standard among its members," and that it should devote its chief endeavors to the performance of these objects.

We feel, however, that the time has now come when this society should adopt the principle of becoming an active national force in economic, industrial and civic affairs.

This can only be done effectively, however, by active coöperation with other engineering organizations of the country. To this end the committee recommends that a comprehensive organization be formed embracing:

The local affiliation of the branches of the national technical societies and the local technical societies;

A state council composed of representatives from the local affiliations;

A national council consisting of representatives of the national technical societies and from the state council or state group organizations, in lieu thereof.

The object of the council shall be to increase the usefulness of the engineering profession, to bring about greater coöperation and to advance the welfare of engineers.

The council shall have an executive committee, shall maintain a central office and shall hold at least one meeting each year. It would be desirable that a bulletin of general engineering interest be published by the council. The council shall be supported by a per capita contribution or in such other manner as may be determined.

B. Internal Relations and Local Associations.

Your committee makes the following recommendations:

Local Associations.—That every member of the society be a member of a local association.

That there be created in each geographical district of the society an organization consisting of representatives of the local associations in that district.

That local associations and district organizations shall operate under uniform constitutional provisions to the extent only that the same are necessary or desirable to insure uniform relations with the society.

That the representatives of each district on the board of direction and the nominating committee of the society be elected by ballot by the corporate members resident in such district.

That it be the obligation of each local association to bring about within its territory a close affiliation of all branches of the national and of the local technical organizations for the purpose of advancing the status of the engineer.

That in communities where members are too few to form a local association, it be their obligation, in addition to that of their district local association, to affiliate with the resident members of other technical societies, and other engineers, where such affiliations will promote the organization of a local affiliate body.

That the local affiliations be the basis for comprehensive state and national organizations.

C. Technical Activities.

Meetings.—That local associations should hold not less than four stated meetings per year and encourage joint meetings with kindred societies.

That the fortnightly meetings of the parent society should be discontinued.

That the semi-annual meetings of the parent society should be supplemented by the addition of a spring and fall meeting held successively in different sections of the country under the auspices of a local association.

Papers.—That the present system of securing papers depends wholly upon voluntary offers and results in a limited variety of subjects. Committees of the parent society and local associations should be formed and charged with the responsibility for promoting greater activity and discussions. Simultaneous discussion of important papers by local associations is desirable.

That the use of the monthly Proceedings should be extended to include editorial work, abstracting and reviewing important engineering articles and subjects of popular interest to the great majority of engineers.

Committees.—That there be created

(*Continued on page 475*)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Preliminary plans are being prepared by the consulting engineer, E. E. Harper, for the construction of a 500,000 gallon FILTRATION PLANT for the city of Cameron, Mo.

Lansing, Ill., is planning to make WATERWORKS IMPROVEMENTS to cost $150,000, according to plans being prepared by the consulting engineer, E. A. Rossiter.

Danbury, Conn., is to construct new PAVEMENTS for which a bond issue of $100,000 has been authorized. Clarence D. Pollock, of the firm of Pollock and Taber, has been retained as consulting engineer.

Jewett, O., is having plans prepared by the consulting engineer, W. J. Sherman, for the construction of a WATERWORKS SYSTEM, including sinking wells, and building pumping plant and pipe lines.

WATERWORKS IMPROVEMENTS, including a mechanical water filtration plant and centrifugal pumping equipment, are to be made by the city of Whiting, Ind., for which bids have been advertised. The consulting engineers are Pearse & Greeley.

Searcy county, Marshall, Ark., plans ROAD IMPROVEMENTS on eighty-seven miles of road including macadam surfacing on forty-seven miles, construction of bridges, etc., the total cost to be $500,000. The consulting engineers are The Winn Engineering Co.

Lima, O., is to build relief trunk SEWERS, to cost $1,000,000. The consulting engineers are the firm of Fuller & McClintock.

Lowndes co., Valdosta, Ga., is to build a reinforced concrete BRIDGE for which bids have been called. The consulting engineers are the J. B. McCrary Co.

A sanitary SEWER and SEWAGE DISPOSAL PLANT is to be built by the city of Churdan, Ia. Plans are being prepared by the consulting engineer, C. H. Currie.

Bay City, Mich., has had preliminary plans prepared for WATERWORKS IMPROVEMENTS to cost $1,000,000. The consulting engineers are Burns & McDonnell.

Pope county, Russelville, Ark., will open bids soon for the construction of a bituminous macadam ROAD, about twenty-five miles in length, to cost approximately $400,000. The consulting engineers are the Parkes Engineering Company.

SEWAGE TREATMENT WORKS, including sewage pumping station, pumps and automatic control equipment, a sewage sedimentation tank, sprinkling filter, sludge bed and chlorinating plant, are to be constructed for the Weston State Hospital, Weston, W. Va., according to plans prepared by the consulting engineer, Charles E. Collins.

INDUSTRIAL NEWS

Road Contractor Saves Money with Motor Truck.

A New York contractor hauling materials for concrete road construction affected substantial savings by using a motor truck instead of teams.

Loading was done entirely by hand, requiring twenty minutes to load two tons per trip an average distance of three miles. This made the commercial ton-mile cost 29c. A two-ton Federal truck was put on the job and made eleven trips, making a total of 66 ton-miles. The truck cost $12.00 a day and thus worked for 18c per ton-mile, saving 11c per ton-mile and hauling 22 tons per day as compared to the 8 tons of the team.

Had the truck been loaded by overhead bins, the savings would have been much greater, it is estimated. Also the tons hauled would have been greatly increased. It required three hours and forty minutes to load for the eleven trips. Unloading time was kept low by the power dump body with which the truck was equipped. If a loading device had been used, the truck could easily have been loaded in two minutes—a total of 22 minutes for the eleven trips. Thirty minutes would have been a liberal allowance for loading time. This would mean a saving of three hours and ten minutes. The truck averaged 35 minutes running time per trip. In the 3 hrs. 10 minutes, it could make 5 trips and still have some time for delays. This would make a total of 16 trips, 32 tons or 96 ton-miles for the day's work. The cost per ton-mile would then be a little over 12c. This means a saving of 17c per ton-mile over the horse method—more than 50 per cent, besides having hauled 24 more tons. This would also mean a reduction of 6c per ton-mile or thirty-three and one-third per cent over that of the truck when loaded by hand, besides hauling ten tons additional.

Material Handling Machinery Manufacturers' Association.

The Material Handling Machinery Manufacturers' Association, at its first semi-annual meeting at the Hotel Astor, New York City, on June 10 and 11, began the development of plans for a nation-wide educational campaign directed at manufacturers and the general public on the need for further development in the use of labor-saving devices.

Coöperative advertising through the medium of motion pictures will be a feature of the campaign as outlined at the preliminary meeting on June 10 of the advertising managers of the concerns represented. An advertising council was also formed to join with Zenas W. Carter, the association's secretary-manager, in this work. The object will be to stimulate interest in mechanical handling devices generally rather than in any one appliance in particular. A number of authorities on the subject of publicity spoke and advocated coöperation among manufacturers.

At the morning session on June 11 President Calvin Tompkins outlined the association's program, declaring that it faced an unequaled opportunity to demonstrate the effectiveness of cooperative publicity. The association must prove to labor as well as capital that more extensive use of mechanical appliances would increase productivity and be a benefit to all concerned, he said.

Among those who spoke at the afternoon session were James H. Collins, writer on industrial subjects; Francis Holly, director of commercial economics, Washington, D. C., and David B Rushmore, General Electric Company.

At the evening session ex-Senator Theodore N. Burton spoke on "Extension in Port and Terminal Facilities as the Determining Factor in the Success of the American Merchant Marine."

The Sullivan Machinery Co., Chicago, Ill., regrets to announce the death, on May 10, after a protracted illness, of George Elmer Wolcott, New England sales manager. Mr. Wolcott has been identified with the company since 1888. After attaining a position of responsibility and trust, which he held for a number of years at the Claremont works of the company, he was appointed New England sales manager in 1905; and had made Boston his headquarters since 1911. The officers of the Sullivan Machinery Company take this opportunity of paying tribute to the qualities of loyalty, honesty and strength of purpose; and to the sympathetic spirit and kindliness which marked the character of their former associate and friend.

The company has appointed George H. Richey as New England sales manager to succeed Mr. Wolcott. Mr. Richey has been associated with Mr. Wolcott as sales engineer in New England and eastern Canada for several years past. The Boston offices remain at 201 Devonshire street as heretofore.

NEWS OF THE SOCIETIES

(*Continued from page 474*)

advisory standing committees of the board to promote the study of important engineering subjects and charged with outlining and coördinating the work of like committees of the local associations. Three members of the board should constitute a standing advisory committee on each subject. Local associations should urge the younger members to identify themselves with local committee work.

That local associations should suggest names of volunteers possessing necessary qualifications for special committee service, and that tenure of committee membership shall terminate automatically on account of absence or inactivity.

That the society support an active program of research work, coöperating, if practicable, with existing research agencies.

That the chairmen of the standing advisory committees of the board should constitute the publication committee.

That to effectively carry out the intent of these recommendations a technical editorial staff under the direction of the publication committee should be established.

Sections or Divisions of the Society for Specialized Lines of Work.—It is not recommended that the work either of the parent society or the local association be divided in this way. The object apparently sought by such divisions will be better met by the work of strong committees.

Coöperation with Specialized Engineering Societies and Other Organizations.—Much of value has been accomplished in the past in this way and it is recommended that such work be continued and extended.

Standards in Engineering Practice.—There exists at the present a committee known as the American Engineering Standards Committee, composed of representatives of the national engineering societies. This line of coöperation and advice is approved, and it is recommended that it be continued and extended, but the idea of developing this committee into another association is deprecated.

It is recommended that a book of recommended practice and standards be compiled which shall be revised periodically to follow the development of engineering.

D. Relation to Public Affairs.

Definition of Engineering.—That the three main ideas in a complete definition of engineering should be as follows:

1. A general and descriptive statement.
2. The content of the profession—the things that engineering does.
3. The aims and motives the profession should have.

Ethics.—That a short code of ethics of broad scope, general character, and positive rather than negative injunction, be prepared.

Engineering Education.—That a standing committee of seven be created to consider questions of educational policy, and offer advice and guidance in carrying out such policy. The aims of engineering education, fundamental requirements, changes in curricula indicated by changing social and industrial conditions, the qualifications of teachers, and the standardization of degrees, are a few of the topics which such a committee should rightly consider. Further, that local associations appoint similar committees of three or five to coöperate with educational institutions in their respective territories.

Licensing.—That the society, in cooperation with the other founder societies, prepare a standard form of bill for the licensing or registration of engineers, to be used in the framing of legislation.

Arbitration and Expert Testimony.—It is the belief of the committee that the present practice with regard to expert testimony and arbitration is not satisfactory, and it is recommended that a committee of the American Bar Association be asked to coöperate with the joint committee from the four founder societies, in order to develop better practice along these lines.

Publicity.—It is recommended that the preparation of general articles on engineering subjects be encouraged and assisted by the profession, especially with a view toward having such articles published in the standard magazines.

Legislation and Development of Natural Resources.—It is recommended that the national council maintain an agency in Washington, D. C., or elsewhere, for the purpose of keeping advised of all proposed Federal legislation and departmental rulings and regulations involving, directly or indirectly, questions of engineering; and that such agency keep the society or its locals advised from time to time of such matters. It shall also be the duty of the various locals to keep advised on all proposed state legislation affecting engineering matters, and the said locals shall actively interest themselves to the end that proper legislation may be enacted. It is also recommended that such agency, and the state and national councils, shall keep advised as to the proposed creation of federal and state commissions, whose activities may affect engineering enterprise; and that the influence of the lo-

cals and the society at large shall be directed toward securing the appointment of engineers upon such commissions.

The Service of the Engineer to the Community, State and Nation.—The engineering profession owes a duty to the public which it is believed can best be discharged by the active participation of every engineer in the civic work of his locality. To this end it is urged that the engineer join the civic body of his community, and, if there be no such organization, that he should then endeavor to organize the community for civic work, in sympathetic cooperation with the governing body. The engineer's duty to the public also requires that he give his best efforts to matters of state, interstate and national character, calling upon the various engineering bodies for assistance and cooperation when necessary.

Patent Law.—Inasmuch as a nation-wide society of inventors has been formed, composed largely of engineers, one of whose objects is to handle the subject of patent law, it is recommended that no action be taken on this subject at the present time.

Co-ordination of Governmental Activities.—It is recommended that the influence of the entire membership of the society be directed toward the creation of a Federal Department of Public Works, the secretary of which shall be technically qualified and a member of the President's cabinet, and that the law creating such department shall provide for the co-ordination of all government engineering activities.

Industrial Affairs.—That fundamentals of industry and their inter-relations are based on engineering principles which form a part of the education of the engineer.

It is the hope of the Committee on Development that all members will contribute their opinions on the report and that it will be possible to have ready the final report by November 1. A committee of three was appointed, consisting of Gardner S. Williams, George G. Anderson and Richard L. Humphrey to represent the committee in conference with representatives of development or similar committees of the national mechanical, electrical and mining engineering societies.

Illuminating Engineering Society.

The election of the following officers of the Illuminating Engineering Society for the fiscal year 1919-1920 has been confirmed by the council. They were elected to fill the offices made vacant by expiration of terms: President, S. E. Doane; Vice-president, William J. Clark; General Secretary, Clarence L. Law; Treasurer, L. B. Marks; Directors, E. C. Crittenden, F. E. Cady and R. B. Ely. The membership of the council for 1919-1920 will therefore be as follows: S. E. Doane, president; G. H. Stickney, junior past-president; George A. Hoadley, junior past-president; William J. Clark, vice-president; H. A. Hornor, vice-president; Otis L. Johnson, vice-president; H. K. Morrison, vice-president; Clarence L. Law, general secretary; L. B. Marks, treasurer; Adolph Hertz, S. C. Roger, P. S. Young, John C. D. Clark, Evan J. Edwards, James J. Kirk, E. C. Crittenden, F. E. Cady and R. B. Ely, directors.

Samuel E. Doane, the new president of the Illuminating Engineering Society, is chief engineer of the National Lamp Works of the General Electric Company.

The 1919 convention of the society will be held at the Hotel Sherman, Chicago, on Oct. 20 to 23 inclusive.

Colorado Engineering Council.

At a recent meeting in Denver, representatives of eight organizations of the state met and formally inaugurated the Colorado Engineering Council. Its object, according to its constitution, will be "to coordinate the work of various technical, scientific, and engineering organizations, promote the welfare and professional standing of their members and foster a more general recognition of the engineer in civil matters." Among the associations represented were the Colorado Scientific Society, the Teknik, the Colorado Society of Engineers and the local associations of the four national engineering societies. The following officers were elected: Arthur Ridgway, president; E. G. Carpenter, vice-president, and Robert J. Grant, secretary and treasurer. Meetings of the council are to be held at least once a month.

PERSONALS

Stern, Maj. Eugene W., Engineers, U. S. A., who received his discharge from the service, has opened an office for the practice of engineering at 56 W. 45th St., New York City. Mr. Stern was formerly chief engineer of highways, Borough of Manhattan, New York City.

Windrow, R. J., of Waco, Texas, has been appointed state highway engineer of Texas, by the state highway commission, succeeding George A. Buren, who has retired to private practice. Mr. Windrow is a graduate in civil engineering from the Agricultural College of Texas, and has had extensive experience in roadbuilding in McLennan County, Texas. He recently resigned as city engineer of Waco to engage in contracting.

Oakes, Henry, Engineers, U. S. A., who recently received his discharge from the service, has been appointed city engineer of Muskegon Heights, Mich.

Moomaw, Dalton, formerly road engineer of Cuyahoga County, Ohio, with headquarters in Cleveland, is now county road engineer of St. Joseph County, Indiana, with office in South Bend.

Bollinger, Harry, has been appointed city engineer of Columbia City, Ind., succeeding Claude Anspaugh, who has resigned to devote his entire time to the duties of county surveyor.

Smalley, Arthur A., assistant city engineer of Pleasant Lake, Ind., has resigned to become assistant city engineer of Hamilton, Ohio.

Bruce, Ernest, civil engineer, Charleston, W. Va., has been apointed chief of the engineering department of that city, succeeding Harry Wiley, resigned.

Eckert, O. E., formerly connected with the engineering division of the Michigan state board of health, has been appointed city engineer of Lansing, Mich.

Helmreich, L. W., formerly assistant engineer, Missouri Public Utilities Commission, is now engineer of the recently organized Arkansas Corporation Commission, which will have jurisdiction over the public utilities of the state.

Deutschman, Fred J., Aurora, Ill., has been appointed city engineer of Mitchell, S. D., succeeding S. H. Smith, who recently resigned. Mr. Deutschman was previously city engineer of Belleville, Ill.

Darton, Capt. H. E., formerly of the 162nd Depot Brigade, Camp Pike, has been appointed highway engineer of Arkansas, succeeding John P. Harper, resigned.

Judy, Wilbur H., who since 1914 has been connected with the water-impounding system, and has served as chief inspector of the operating department of the city of San Diego, Cal., has been appointed manager of operation of the city.

Bouton, Edward H., and Maj. Ezra B. Whitman, of the firm of Norton, Bird & Whitman, consulting engineers, New York City and Baltimore, former water engineer of Baltimore, who has recently been on duty at Camp Meade, Maryland, have sailed from New York for England, whence they expect to proceed to Poland to investigate the field there for the establishment of public utilities, such as water and sewerage systems, railroad and highway improvements. They do not expect to leave England for Poland until after the peace treaty is signed.

The engineering firm of Morris Knowles, Inc., Pittsburgh, Pa., announced the completion of its work for the United States War Department as supervising engineers at Camp Meade, Md., and Camp McClellan, Ala. The engagement of Morris Knowles, M. Am. Soc. C. E., as chief engineer of the Housing Department, the Emergency Fleet Corporation, United States Shipping Board is ended.

Captain Maurice R. Scharff, Assoc. Mem. Am. Soc. C. E., has returned after eighteen months of service with the Corps of Engineers in France. Charles M. Reppert, M. Am. Soc. C. E., formerly in charge of the division of design in the bureau of engineering, Department of Public Works, city of Pittsburgh, and more recently deputy chief engineer of the Housing Department, Emergency Fleet Corporation, United States Shipping Board, has been added to the staff. A. B. Hargis, formerly assistant to the city engineer, Birmingham, Ala., and latterly deputy chief engineer with Morris Knowles, Inc., supervising engineers, Camp McClellan, Ala., has been transferred to the Pittsburgh office.

ADVANCE CONTRACT NEWS

ADVANCE INFORMATION
BIDS ASKED FOR

CONTRACTS AWARDED
ITEMIZED PRICES

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

BIDS ASKED FOR

STREETS AND ROADS.

Ala., Guntersville. **July 8.**
Grading, draining and surfacing with macadam 5,60 mi. road in Marshall Co.—W. S. Keller, State Hwy. Engr., Montgomery.

Cal., Riverside. **July 7.**
700 ft. paving, involving 27,200 sq. ft. 5-in. oiled macadam or concrete paving.—A. F. Fulmore, Engr.

Cal., Santa Ana. **July 2.**
3.02 mi. canyon road involving 1,500 cu. yd. excav., 650 lin ft. cement curbs, 3,480 cu. yd. concrete pavement and 56,000 lbs. triangular mesh reinforcement.—J. M. Backs, Clk. Bd. Supvrs.

Del., Dover. **2 p.m., July 9.**
8.27 mi. state highway of cement concrete in New Castle and Kent counties, involving 8.5 acres clearing and grubbing; 98,500 cu. yd. grading; 1,200 lin. ft. 15 to 36-in. reinforced concrete pipe; 3,500 lin. ft. guard rail; 1,675 tons stone for macadam; 600 sq. yd. penetration macadam; 14,980 cu. yd. cement concrete roadway; 400 joints; 2,000 sq. yd. roadway reinforcement, etc.—C. M. Upham, Chief Engr., State Hwy. Dept.

Fla., Bronson. **July 8.**
Highway in Levy Co.—F. Thomas, Engr., Gainesville.

Fla., Gainesville. **July 8.**
46,000 sq. yd. limestone surfacing, 13,000 cu. yd. grading and 18 acres clearing and grubbing in Levy Co.—Co. Bd. Comrs.

Fla., Ocala. **July 7.**
Portions of four roads, involving 28.4 mi., in Marion Co.—O. H. Rogers, Chmn., Bd. Co. Comrs.

Fla., Leesburg. **3 p.m., July 7.**
50,000 sq. yd. sheet asphalt, brick, asphaltic concrete, concrete, bitulithic or penetration macadam pavement.—J. B. McCrary Co., Engrs., Atlanta, Ga.

Ga., Rome. **2 p.m., July 22.**
Seven mi. road through Floyd Co., including drains, culverts, etc., involving 15,687.5 cu. yd. earth excavation, 13,124.8 cu. yd. borrow excavation, 20,080.3 cu. yd. top soil surfacing, 472.5 lin. ft. 12 to 24-in. D. S. citr. clay pipe, etc.—J. B. McCrary Co., Engrs., Third Natl. Bank Bldg., Atlanta.

Ga., Brunswick. **noon, July 5.**
105,000 sq. yd. street paving—E. R. Conant, Cons. Engr.

Ga., Brunswick. **noon, July 5.**
Paving 4.4 mi. or 46,000 sq. yd. hwy.—E. R. Conant, Cons. Engr.

Ill., Springfield. **10 a.m., June 25.**
Road work on Springfield-East St. Louis and Henry-Morris Hwys., involving 252,633.5 ft. in Sangamon, Macoupin and Marshall counties, of Portland cement concrete, monolithic brick (4 or 3-in.), or bituminous concrete with or without binder course.—C. Older, Chief Hwy. Engr.

Ill., Pekin. **2 p.m., July 5.**
8,000 ft. pavement 16 ft. wide, including grading and culverts, pavement of Portland cement concrete or monolithic brick.—R. E. Rollins, Town Clk.

Ind., Rockville. **1 p.m., July 8.**
3,823 ft. gravel road in Howard and Green Twps. and 1¼ mi. gravel road in Penn Twp.—R. E Porter, Co. Aud.

Ind., Frankfort. **2 p.m., July 8.**
Five gravel roads in Center, Union, Johnson, and on line between Union and Ross Twps.—E. Spray, Co. Aud.

Ind., Martinsville. **2 p.m., July 8.**
Stone road in Ashland Twp., three gravel roads in Clay, Gregg and Monroe Twps., and two crushed stone roads in Adams Twp.—H. H. Nutter, Co. Aud.

Ind., Salem. **1.30 p. m., July 8.**
Four roads in Washington and Posey Twps., aggregating 36,503 ft.—E. E. Batt, Co. Aud.

Ind., Muncie. **10 a.m., July 8.**
Gravel road in Perry Twp .and 7,525 lin. ft. bituminous macadam road in Union Twp.—J. P. Dragoo, Co. Aud.

Ind., Sullivan. **noon, July 8.**
Three gravel roads in Turman, Jackson and Haddon Twps., two concrete roads in Hamilton Twp. and two macadam roads in Jefferson and Gill Twps.—F. M. Danels, Co. Aud.

Ind., Huntington. **10 a.m., July 8.**
Four roads in Jackson and Clear Creek Twps.—O. E. Eviston, Co. Aud.

Ind., Rochester. **2 p.m., July 8.**
Brick road in Rochester Twp.—E. A. Smith, Co. Aud.

Ind., Madison. **1 p.m., July 8.**
Gravel road in Graham Twp.—C. S. Dibler, Co. Aud.

Ind., Corydon. **2 p.m., July 8.**
Stone road in Washington Twp.—S. C. Mauck, Co. Aud.

Ind., Lebanon. **10 a.m., July 8.**
Two gravel roads in Center and Jefferson Twps.—C. Goodwin Co. Aud.

Ind., Williamsport. **9 A. M., July 7.**
10,586 ft. gravel road and 10,711 ft. gravel road and bridging waterways in Prairie Twp.—W. H. Stephens, Co. Aud.

Ind., Spencer. **2 P. M., July 7.**
Stone road in Harrison Twp. and limestone road in Taylor Twp.—S. M. Royer, Co. Aud.

Ind., Rensselaer. **2 p.m., July 7.**
Six stone roads in Union, Kankakee, Barkeley and Marion, Marion, Jordan and Newton Twps.—J. P. Hammond, Co. Aud.

Ind., Greencastle. **11 a.m., July 7.**
14,500 ft. macadam road in Warren and Cloverdale Twps.—J. M. Allen, Co. Aud.

Ind., Lawrenceburg. **10 a.m., July 8.**
10,264.5 ft. broken stone road in Washington Twp.—A. E. Jackson, Co. Aud.

Ind., Monticello. **10 a.m., July 8.**
Three crushed stone roads in Monon, Union and Honey Creek Twps. and one gravel road in Prairie Twp.—F. E. Vinson, Co. Aud.

Ind., Decatur. **10 a.m., July 8.**
Four crushed stone roads in Monroe and French, Washington and Monroe Twps.—J. Mosure, Co. Aud.

Ind., Anderson. **10 a.m., July 2.**
33,133.5 ft. concrete road in Pipecreek and Duckcreek Twps.—E. T. Flahavin, Co. Aud.

Ind., Tipton. **10 a.m., July 7.**
13,266 ft. concrete road in Liberty Twp. and 3,255 ft. gravel road in Cicero Twp.—C. Grishaw, Co. Aud.

Ind., Rushville. **2 p.m., July 7.**
Gravel road on line between Rushville and Walker Twps.—W. H. McMillin, Co. Aud.

Ind., Rockport. **2 p.m., July 7.**
Gravel road in Ohio Twp.—A. Parker, Co. Aud.

Ind., Bloomfield. **2 p.m., July 8.**
Two macadam roads in Grant and Stockton and Highland Twps.—H. Corbin, Co. Aud.

Ind., Columbia City. **noon, July 8.**
Completing road in Smith Twp.—W. K. Burwell, Co. Aud.

Ind., Winamac. **noon, July 8.**
Three mi. gravel road in Van Buren Twp., 2⅞ mi. gravel road in Jefferson, White Post, Salem and Beaver Twps., 15,817 ft. crushed stone road in Salem Twp. and three mi. gravel road on line between Indian Creek and Van Buren Twps.—J. C. Howe, Co. Aud.

Ind., Decatur. **10 a.m., July 9.**
Crushed stone road in Washington Twp.—J. Mosure, Co. Aud.

Ind., Bedford. **1 p.m., July 8.**
Four gravel or macadamized roads in Spice Valley, Perry and Marion Twps.—Wm. M. Denniston, Co. Aud.

Ind., Indianapolis. **10 a.m., June 30.**
Improving various streets and alleys.—Bd. Pub. Wks.

Ind., Rochester. **2 p.m., July 8.**
Brick road in Rochester Twp.—E. A. Smith, Co. Aud.

Ind., Valparaiso. **2 p.m., July 8.**
2.48 mi. gravel road in Morgan Twp. and 1.76 mi. gravel road in Union Twp.—B. H. Kinne, Co. Aud.

Ind., Bloomfield. **2 p.m., July 8.**
Two macadam roads, one in Grant and Stockton Twps. and one in Highland Twp.—H. Corbin, Co. Aud.

Ind., Jasper. **2 P. M., July 7.**
Crushed limestone road in Patoka Twp., 2 mi. 13 rods.—J. H. Seng, Co. Aud.

Ind., Brownstown. **1 p.m., July 7.**
3 concr. roads in Jackson twp.—A. Luedtke, Co. Aud.

Ind., Brazil. **10.30 a.m., July 8.**
Limestone and gravel road in Sugar Ridge twp.; gravel road on line between Washington twp. Putnam Co., and Van Buren twp., Clay Co.—W. E. Parrish, Co. Aud.

Ind., Vevay. **1 p.m., July 7.**
68,640 ft. limestone road in Jefferson and Cotton twps.—W. A. Reeves, Co. Aud.

Ia., Albia. **2 p.m., July 1.**
Main and lateral sewers, involving 8,348 ft. 8-12-in. main sewer, 22 manholes, manholes, cast iron pipe, etc.; 20,828 ft. 8-in. lateral sewer.—C. C. Atchison, City Clk.

Ia., Tabor. **noon, July 1.**
5,219 ft. curbing and 21,686 sq. yd. paving with concrete, asphaltic concrete, brick, sheet asphalt, bituminated concrete or bituminous macadam.—T. S. DeLay, Cons. Engr., Creston.

Ia., Rockford. **8 p.m., July 1.**
25,000 sq. yd. reinforced concrete paving and 12,000 lin. ft. cement curbing.—R. E. Martens, Town Clk.

Kan., Ellsworth. **July 7.**
13,885 sq. yd. brick, asphaltic concrete or concrete paving, 5,090 lin. ft. combined concrete curb and gutter, 780 lin. ft. 12-in. and 205 lin. ft. 15-in. vitrified sewer pipe.—Black & Veatch, Engrs., 507 Interstate Bldg., Kansas City, Mo.

La., Alexandria. **July 7.**
Paving roadways and sidewalks in various streets.—V. M. Ake, Secy.

La., Cameron. **July 7.**
Hwys. in Road Districts 3, 4 and 5.—T. H. Mandell, Engr., Lake Charles.

Me., Portland. **noon, July 2.**
Granite block pavement in various streets.—E. W. Hunt, Comr. Pub. Wks.

Mass., Boston. **noon, July 1.**
4,700 ft. oil gravel road in Dudley and 9,700 ft. asphalt road in Quincy, etc.—F. I. Bieler, Secy., State Hwy. Comn., State House.

Minn., Grand Rapids. **10 a.m., July 14.**
8.95 mi. fed. aid proj. No. 52, involving 54 acres clearing, 44 acres grubbing, 36,300 cu. yd. excav., 1,320 cu. yd. hand ditching, 960 lin. ft. sectional concr. culverts (12 to 36-in.), 3,775 lin. ft. guard rail, 10,500 cu. yd. gravel surfacing, etc.—T. Erskine, Co. Aud.

Minn., Ortonville. **10 a.m., July 7.**
State roads, bridges and culverts in Stone Co.—Hwy. Engr., Court House.

BIDS ASKED FOR

Minn., Pipestone. 1.30 p.m., July 8.
State road, involving 33,951 cu. yd. grading, 13,082 cu. yd. side excavation, 76,500 cu. yd. overhaul, 12,166 cu. yd. graveling, etc.; also state road involving 27,392 cu. yd. graveling, etc.—T. A. Bailey, Co. Aud.

Minn., Ivanhoe. 10 a.m., July 14.
State roads, involving 9,185 cu. yd. graveling, haul from one-half to 3½ mi., etc.—A. L. Swenson, Co. Aud.

Minn., Cambridge. 10 a.m., July 14.
Furnishing 7,000 cu. yd. road gravel, delivered at Minneapolis.—F. A. Norell, Co. Aud.

Miss., Moss Point. 7.30 p.m., July 1.
28,000 yd. slag surfaced streets.—C. M. Fairley, City Clk.

Miss., Tehula. 2 p.m., July 2.
Grading, graveling, bridges and culverts on 6 mi. road and graveling 14.5 mi. roads.—J. H. Fuqua, Chancery Clk., Lexington.

Miss., Lexington. July 2.
Improving 20½ mi. highway, involving 6 mi. grading, graveling, culverts and bridges and 14½ mi. graveling.—J. M. Harbert Engrg. Co., Indanola.

Miss., Magnolia. 2 p.m., July 5.
Improving road.—X. A. Kramer, Hwy. Engr.

Mo., St. Louis. noon, July 8.
Improving city streets with bituminous macadam and concrete curb and with vitrified brick and granite curb; reconstructing intersections of streets with treated wood block pavement.—E. R. Kinsey, Bd. Pub. Serv.

Mo., St. Louis. noon, July 15.
Reconstructing street with treated wood block pavement and granite curb; improving three streets with bitulithic pavement and granite or concrete curb. —E. R. Kinsey, Pres., Bd. Pub. Serv.

Nebr., Wauneta. 11 a.m., July 2.
Road work in Hayes and Chase counties.—E. E. Gurrett, Clk., Chase Co.

Neb., Hayes Center. July 2.
Grading and improving 16 mi. road 24 ft. wide, involving 104,000 cu. yd. earth excavation, 758 lin. ft. 18-24-in. concrete pipe, etc.—G. E. Johnson, Engr., State Hwy. Dept., Lincoln.

Neb., Omaha. July 5.
Grading 23.7 mi. highway wide, involving 90,500 cu. yd. earth excavation and 872 lin. ft. 18-48-in. concrete pipe culverts, etc.—G. E. Johnson, Engr., State Hwy. Dept., Lincoln.

Neb., Stockville. July 8.
12.1 mi. road 24 ft. wide, involving 75,000 cu. yd. earth excavation, and 788 lin. ft. 18-48-in. corrugated pipe culverts—G. E. Johnson, State Hwy. Dept., Lincoln.

N. J., Ridgefield Park. 9 a.m., July 1.
Improving 3 streets.—M. D. Starker, Vil. Clk.

N. J., Woodstown. 7.30 p.m., July 7.
27,475 sq. yd. surface pavement on repaired bituminous concrete foundation.—Keasbey & Sparks, Engrs., Mecum Bldg., Salem.

N. J., Elizabeth. 2.30 p.m., July 3.
Paving various roads, involving 26,794 sq. yd. asphalt concrete pavement on 6-in. concrete base, 240 sq. yd. sidewalks adjusted or reset, etc.; also 26,025 sq. yd. new granite block pavement on 6-in. concrete base, 8,681 sq. yd. napped trap blocks between railway tracks, 10,600 lin. ft. new bluestone curb, etc.—City Engr.

N. J., Roselle. 8.30 p.m., July 7.
Paving street, involving 3,492 sq. yd. 6-in. macadam and 553 cu. yd. excavation; also 1,887 lin. ft. 4-ft. concrete sidewalks.—W. H. Luster, Boro. Engr., 286 N. Broad St., Elizabeth.

N. J., Atlantic City. 11 a.m., July 9.
Concrete gutters in town of Hammonton.—A. H. Nelson, Co. Engr., 636 Guarantee Trust Bldg.

N. J., Milltown. 2.30 p.m., July 10.
Repairing street with warrenite surface on concrete foundation, involving 13,600 sq. yd. pavement.—A. B. Fox, Co. Engr., 175 Smith St., Perth Amboy.

N. J., Trenton. 10.30 a.m., July 2.
Improving state highway from Robbinsville to Windsor in Mercer Co., involving 26,843 sq. yd. concrete surface.—A. L. Grover, Chief Clk., State Hwy. Comn.

N. J., Mount Holly. 11 A. M., July 2.
Reconstructing road in Evesham Twp., Burlington Co., involving 31,680 sy. yd. surface pavement.—J. Logan, Co. Engr., 11 Main St.

N. J., Elizabeth. 2.30 p.m., July 27.
Two roadway intersections of macadam or amiesite in Summit; 5,500 ft. bituminous concrete roadway on old and new macadam base in New Providence. —J. L. Bauer, Co. Engr., 120 Broad St.

N. J., Trenton. 10.30 a.m., July 9.
45,692 sq. yd. concr. surface road in Morris Co., and 1,772 cu. yd. grading in Union Co.—A. L. Grover, Chf. Clk., State Hwy. Comn.

N. J., Trenton. 10.30 a.m., July 11.
41,000 sq. yd. concr. surface road in Middlesex and Somerset Cos.—A. L. Grover, Chf. Clk., State Hwy. Comn.

N. M., Albuquerque. 2 p.m., July 2.
105,000 sq. yd. bitulithic, asphaltic concrete or reinforced cement concrete pavement, 50,000 lin. ft. curb and gutter, 12,000 sq. yd. alley pavement, 12,400 lin. ft. 8 to 36-in. clay vitrified sewer with necessary manholes and catchbasins.—City Engr.

N. Y., Niagara Falls. 10 a.m., July 1.
1½ mi. concrete pavement.—F. H. Krull, Clk., Bd. Supvrs., Court House, Lockport.

N. Y., St. George, S. I. noon, July 3.
Repairing roadway with bituminous concrete pavement, involving 550 sq. yd. pavement, etc. C. D. Van Name, Pres., Boro. Richmond.

N. Y., New York. 2 p.m., July 2.
Repaving with granite block on concrete foundation roadways of several streets, and repaving with wood block on concrete foundation roadway of one street.—F. L. Dowling, Pres., Boro. of Manhattan.

N. Y., Waverly. 7 p.m., July 7.
Improving street, involving 1,200 yd. excavation, 1,800 yds. compressed gravel pavement, 2,200 yds. reinforced concrete pavement, 1,400 ft. curb and gutter and 1,450 ft. concrete curb.—P. Kerrigan, Vil. Clk.

N. Y., St. George, S. I. noon, June 30.
Concrete curb with steel guard, involving 670 lin. ft. curbing.—C. D. Van Name, Pres., Boro. of Richmond.

N. Y., New York. 2 p.m., June 30.
Repaving with sheet asphalt on concrete foundation and with granite block on concrete foundation the roadways of a number of streets.—F. L. Dowling, Pres., Boro. of Manhattan.

N. Y., Albany. 1 p.m., July 1.
Improving 41.28 mi. highways in Albany, Herkimer, Oneida, Saratoga and Suffolks counties; completing 63.53 mi. highways in Cattaraugus, Cayuga, Cortland, Erie, Franklin, Hamilton, Jefferson, Madison, Niagara, Schenectady and Wayne counties; repairing highway in Rensselaer and one in Ulster counties.—F. S. Greene, Comr. Hwys.

N. C., Clinton. noon, July 1.
Grading, draining and curbing 10,000 to 30,000 sq. yd. sheet asphalt paving on concrete foundation, etc.—H. A. James, Town Clk.

N. C., Kinston. 2.30 p.m., July 8.
18,820 sq. yd. concrete sheet asphalt or warrenite pavement, 3,282 cu. yd. excav., 242 cu. yd. box culvert concrete on highway in Lenoir Co.—H. C. Hines, Secy. State Hwy. Comn., Raleigh.

N. D., Bottineau. 3.30 p.m., July 8.
8.01 mi. earth road, fed. aid proj. No. 40—G. R. Hurd, Co. Aud.

N. D., Wahpeton. 7.30 p.m., July 7.
Paving, curbing and guttering various streets—S. H. Murray, City Aud.

O., Cleveland. July 2.
Co. road work.—Co. Engr.

O., South Euclid. July 8.
Improving road by constructing sidewalks and grading.—F. A. Pease Engr. Co., Marshall Bldg.

O., Cincinnati. noon, July 14.
Driveways and walks, athletic track and surface drainage in public school. —C. W. Handman, Business Mgr., Bd. Education.

O., Canton. 9 A. M., July 2.
6.87 mi. brick roads and 9,333 sq. yd. 8-in. gravel and 9,333 sq. yd. 8-in. slag swamp road, all in Stark Co.—W. C. Schick, Clk., Bd. Co. Comrs.

O., Celina. July 1.
Improving county road.—R. B. Morrison, Clk., Bd. Comrs. for Mercer and Drake Cos.

O., Canton. noon, July 1.
Improving various streets and constructing sanitary and storm sewers.—J. J. Sonneborn, Dir. Publ Serv.

O., Fremont. July 9.
3,703 sq. yd. brick pavement and 2,785 lin. ft. sandstone curbing.—City Engr.

O., Amherst. July 20.
Grading, paving and curbing various streets, involving 1,700 lin. ft. 4-in. brick paving, etc.—Warden & Laundon, Engrs., 400 Elyria Blk.

Okla., McAlester. 2 p.m., July 7.
Highway improvement in Pittsburgh Co.—W. J. Kindrick, City Clk.

O., Springfield. July 16.
4,653 ft. wood or granite block pavement and sheet asphalt, bitulithic or brick pavement, involving 11,400 sq. yd. paving and 9,100 ft. concrete curb.—O. E. Carr, City Engr.

O., Cleveland. noon, July 2.
Grading, draining, curbing, paving, repaving and improving various streets. —Comr. Engrg., 618 City Hall.

O., Kenmore. July 3.
Sidewalks and grading on city street. —D. P. Dowling, City Engr.

Okla., Poteau. 8 p.m., July 7.
Concrete curbs and gutters, macadam paving, etc., on several streets and alleys.—J. E. Davis, Engr.

Okla., Cushing. 8 p.m., July 8.
20,000 sq. yd. brick paving with storm sewers, grading, curbing, etc.—C. A. Wood, Engr., Stillwater.

Pa., Carrolltown. 10 a.m., July 2.
Reconstructing 2 mi. road 18 ft. wide of vitr. brick paving block on concrete base and curb in West Carroll Twp.; also constructing street or highway on strip of land in Boro. of Carrolltown. 1309 ft. long, 18 ft. wide, of vitr. brick paving block on concrete base and curb. —F. A. Kline, Engr., Bank Bldg.

Pa., Hanover. 4 p.m., July 2.
23,000 sq. yd. pavement on 6-in. concrete base.—A. H. Kohr, Boro. Engr.

Pa., Harrisburg. 10 a.m., July 8.
State road projects involving 109.96 mi. bituminous surface course, Hillside vitr. brick on concr. foundation, or rein. concr. pavement in Bradford, Bucks, Butler, Centre, Clearfield, Clinton, Delaware, Fayette, Lehigh, Luzerne, Somerset, Sullivan, Susquehanna, Tioga, Westmoreland, Wyoming, Lackawanna and York Cos., estimated cost $4,000,000 to $4,500,000.—L. S. Sadler, State Hwy. Comr.

Pa., Pottstown. July 15.
28,715 sq. yd. vitr. brick paving on concr. foundation.—M. L. Seasholtz, Boro. Clerk.

Pa., Pittsburgh. 11 a.m., July 10.
2,000 ft. telford macadam roadway, 16 ft. wide, in Reserve Twp.—Co. Rd. Comr., Court House.

Pa., Minooka. 8.30 p.m., July 1.
300 ft. grading and 225 ft. pipe drain line.—J. J. Powell, 610 Mears Bldg., Scranton.

Pa., Harrisburg. 10 a.m., July 8.
Reconstructing pavements, involving 574,754 ft. bituminous surface course on concrete foundation, reinforced concrete or hillside vitrified brick on concrete foundation, in Bradford, Bucks, Butler, Centre, Clearfield, Clinton, Delaware, Fayette, Luzerne, Somerset, Susquehanna, Sullivan, Tioga, Westmoreland, Lackawanna and Wyoming, Lehigh and York counties.—L. S. Sadler, State Hwy. Comr.

Pa., Beaver. 10 a.m., July 3.
8,500 ft. road in Beaver Co.—J. H. Geer, Clk., Co. Comrs., Court House.

S. D., Milbank. 7.30 p.m., July 7.
Grading, paving and curbing streets, involving 1,666.9 cu. yd. grading, 9,864.3 sq. yd. rein. concr. pavement and 2,946.3 lin. ft. curbs.—A. A. Blomquist, City Aud.

Tex., Weatherford. 3 p.m., July 1.
55,750 sq. yd. street paving, 9,150 cu. yd. excavation and fill, 15,470 lin. ft. combination curb and gutter, 2,110 lin. ft. storm sewer, six manholes and 12 catch-basins.—Henry Exall Elrod Co., Engrs., 209½ Lane St., Dallas.

Tex., Seymour. 10 a.m., July 7.
12.35 mi. graded earth road, involving 27,255 cu. yd. earth excavation, 3.27 mi. road-grader work, 1.83 mi. reshaping, 406 lin. ft. 18 and 24-in. corrugated iron pipe, etc.—C. E. Cock, Engr.

Tex., Electra. noon, July 2.
64,000 sq. yd. asphalt, bitulithic, asphaltic concr., wood blk., brick, birolithic or concr. pavement.—W. H. Larson, City Mgr.

Wash., Port Angeles. 10 a.m., July 7.
Permanent Hwy. No. 7.—R. D. McLaughlin, Co. Aud.

Wash., Seattle. 10 a.m., July 14.
Grading and graveling 3½ mi. road and constructing 2,500-ft. piling trestle. —Bd. King Co. Comrs.

HEAT AND VOLUME UNDER INSTANT CONTROL OF OPERATOR

QUALITY Kinney EFFICIENCY

PATENT COMBINATION AUTO HEATER AND DISTRIBUTOR

POSITIVE PRESSURE PRODUCED BY THE KINNEY PUMP

For Heating and applying under Pressure all varieties of Bituminous Materials, Hot or Cold for Road Construction, Maintenance or Dust Laying.

No Steam Required for Heating
No Danger of Injury to Material
No Clogging of Nozzles
Side Control of Spray

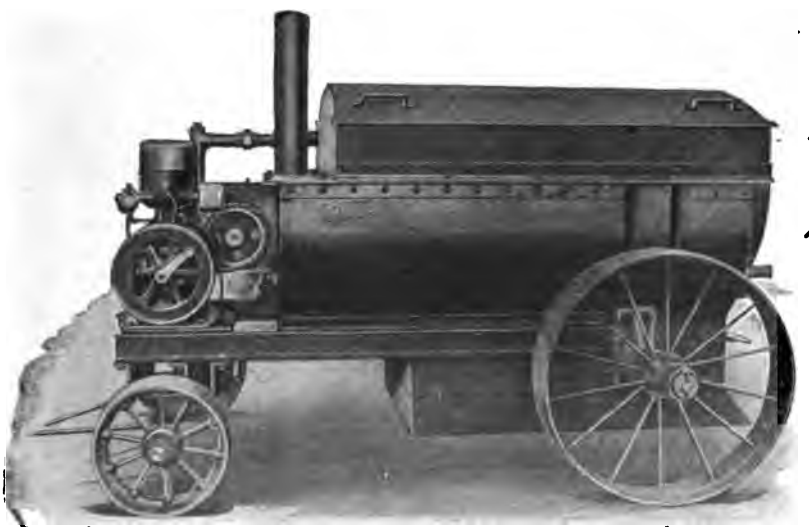
QUALITY Kinney EFFICIENCY

WHEN NOT REQUIRED FOR OILING, TANK AND ENTIRE OILING ATTACHMENT MAY BE REMOVED AND THE TRUCK USED FOR OTHER PURPOSES

DEMOUNTABLE EQUIPMENT

Insures continuous truck service with no loss from idle machinery.

Method of Demounting Oiling Tank and Attachments



QUALITY Kinney EFFICIENCY

HANDY HEATER and SPRAYER

KANT KLOG

KANT KOKE

Pump, Piping, Hose, Nozzles, Automatically Heated

NO STEAM REQUIRED

Contents constantly agitated while heating. No burning or coking of material.

Especially adapted for Road Maintenance, Construction and General Repair Work.

Road Builders, Contractors, Municipalities and all others interested SAVE TIME, LABOR, MONEY by using the KINNEY Equipment.

THE NAME STANDS FOR QUALITY AND HIGHEST EFFICIENCY

KINNEY MANUFACTURING COMPANY

3529-3541 Washington Street, BOSTON, MASS.

New York Philadelphia Chicago Kansas City San Francisco

BIDS ASKED FOR

Wash., Olympia. 2 p.m., July 7.
46 mi. permanent state roads, involving 9 projects.—J. Allen, State Hwy. Comr.

Wash., Vancouver. July 12.
Hard surfacing 4 mi. roadway.—M. E. Carson, Co. Comr.

W. Va., Harrisville. noon, July 7.
Five mi. grading and paving in Ritchie Co.—F. O. Rentshaw, Engr.

W. Va., Lewisburg. Noon, July 1.
2 mi. penetration macadam pavement, 16 ft. wide; also grading and draining proposed road.—F. K. Rader, Co. Engr.

W. Va., Elkins. 1 p.m., July 8.
19 mi. improved roads and streets in Randolph Co. with concrete macadam, tarvia, warrenite or asphaltic concrete pavement.—P. B. Bloomfield, Co. Clk.

Man., St. Adolphe. 11 a.m., July 2.
Two mi. road.—Hwy. Comr., Winnipeg.

N. S., Halifax. 10 a.m., July 9.
23,000 sq. yd. granite block pavement on concrete base; 133,000 sq. yd. bituminous pavement on concrete base and 30,000 sq. yd. bituminous pavement on macadam base and 33,000 lin. ft. concrete curb and gutter.—F. W. W. Doane, City Engr.

N. S., Halifax. 10 a.m., July 9.
Paving streets, involving 23,000 sq. yd. granite block pavement on concrete base, 133,000 sq. yd. bituminous pavement on concrete base, 30,000 sq. yd. bituminous on macadam base and 33,000 lin. ft. concrete curb and gutter.—F. W. W. Doane, City Engr.

SEWERAGE.

Ill., Chicago. noon, July 3.
Sprinkling filter and appurtenances in village of Morton Grove, including connection to existing sedimentation plant, sprinkling filter house, pumping station, secondary settling tank, sludge drying beds, outfall pipe and appurtenances, and embankment around plant.—J. McGillen, Clk., Sanitary Dist. of Chicago.

Ind., Indianapolis. 10 a.m., July 15.
Furnishing glazed sewer pipe for free gravel roads.—L. K. Fesler, Co. Aud.

Ind., Indianapolis. 10 a.m., July 11.
Part of sewage disposal plant, involving 960 lin. ft. 84-in. reinforced concrete intercepting connecting conduit and 300 ft. 75-in. reinforced concrete sewer extension; reinforced concrete grit chambers and overflow; one small pumphouse; one 4-in. electric-driven drain pump, piping and valves; seven sluice gates; 1,000 lin. ft. 60-in. cast iron inverted siphon under river and 7,700 lin. ft. 78-in. reinforced concrete sanitary conduit.—C. H. Hurd, Cons. Engr., 1405 Merchants Bank Bldg.

Ind., Indianapolis. July 11.
Constructing grit chambers to connect with main interceptor, of reinforced concrete with 100,000,000-gal. capacity daily, and small pump house, in connection with sewage disposal plant.—C. S. Hurd, Cons. Engr.

Minn., Milaca. July 16.
Sewer and water mains, involving 2,972 lin. ft. 15-18-in. sewer pipe and 1,572 lin. ft. 4-6-in. cast-iron water mains.—J. B. Gray, Engr.

Minn., North Mankato. 9 p.m., July 14.
Sewer system, involving 3 pumping stations or lifts; 75 manholes, 2 14-in. valves, 24,000 ft. vitr. clay sewer pipe from 8-15-in., 24,200 ft. trench from 5 ft. to 16 ft. deep.—Vil. Engr.

Mo., Kansas City. 2 p.m., Aug. 14.
Turkey Creek sewer, involving 5 mi. sewer.—A. D. Ludlow, Engr., City Hall.

N. J., Pleasantville. 8 p.m., July 7.
Sanitary sewerage system, involving 9.3 mi. 8-in. to 15-in. terra cotta pipe sewers, 1,260 Y branches, 5-in. terra cotta house connections, 123 manholes, etc.—Remington & Vosbury, Engrs., 601 Market St., Camden, N. J.

N. J., West Orange. 8.15 p.m., July 1.
Storm water sewer, involving 140 lin. ft. 18-in. tile pipe, 1,470 lin. ft. 18 to 36-in. lock-joint pipe, 330 lin. ft. concrete culvert, etc.—C. A. Winston, Town Engr., Town Hall.

N. J., Passaic. 10.30 a.m., July 7.
Extending storm water sewer or drain, involving 400 lin. ft. 12 and 18-in. vitr. pipe, 2.69 tons 20-in. cast-iron pipe at outfall, 3 manholes, trenching, etc.—City Engr., Municipal Bldg.

N. J., Elizabeth. 2.30 p.m., July 3.
260 lin. ft. 10-in. T. C. pipe, 75 lin. ft. 6-in. connection to curb, etc.—City Engr.

N. Y., Brooklyn. 11 a.m., July 2.
Repairing street sewer at outlet.—E. Riegelmann, Pres., Boro. of Brooklyn.

O., Toledo. noon, July 1.
Combined local sewer and sanitary sewer.—D. H. Goodwillie, Dir. Pub. Serv.

O., Kenmore. July 3.
Sanitary sewers on city street.—D. P. Dowling, City Engr.

O., Canton. July 1.
Sewers in 12 streets.—City Engr.

O., Columbus. July 11.
Sewage disposal and electric lighting and water system for school building of village of Brice.—Jones & Abernathy, Archts., Bd. Education, Truro. Twp.

S. D., Aberdeen. 9 a.m., July 28.
Storm sewer, involving 8 mi. vitrified, segmental block or concrete pipe from 10 to 96 in. in diameter, with 100 manholes and 212 catch basins.—F. W. Raymond, City Aud.

WATER SUPPLY.

Colo., Sedgwick. noon, July 8.
Municipal electric light and waterworks system, involving one 50,000-gal. steel tank on steel tower 100 ft. high; 4,500 ft. 4 to 8-in. Class B cast iron pipe; 11 fire hydrants, four gate valves; one 6x8 vertical single acting triplex pump; one 8-in. tubular well; one brick pump house; pole line material for local distributing system and transmission line, etc.—W. L. Muller, Clk.

Ill., Elmhurst. 8 p.m., July 7.
Pumping equipment for new well.—Edwin Hancock, 2047 Ogden Ave., Chicago.

Ill., Salem. 8 p.m., July 1.
Mechanical gravity filter plant, consisting of two units of 300,000-gal. cappacity each.—Caldwell Engrg. Co., Jacksonville.

Ind., Evansville. 3 p.m., July 7.
New water main and repairs at U. S. Marine Hospital.—J. A. Wetmore, Acting Superv. Archt., Treasury Dept., Washington, D. C.

Ia., Cherokee. 8 p.m., July 2.
Laying 3,500 ft. water pipe, 2 fire hydrants and 7 valves and boxes, material furnished by city.—Wm. Shardlow, City Clerk.

Ia., Wapello. 1 p.m., July 15.
Steam driven pumping plant containing one 36-in. and one 24-in. double suction centrifugal pump.—Elliott & Harmon Engrg. Co., Peoria, Ill.

Mass., Medford (Boston P. O.). June 25.
Furnishing 6-in. cast-iron water pipe.—F. Charnock, City Engr.

Minn., Brainerd. 7.30 p.m., July 7.
Pumping equipment for proposed improvements in waterworks system, consisting of two motor and engine driven, 3-stage centrifugal fire pumps, two motor and belt driven vertical centrifugal low service pumps, one vertical motor driven centrifugal low service pump and two motor driven sump pumps.—L. P. Wolff, Engr., St. Paul.

Mont., Denton. July 15.
200,000-gal. reservoir, supply mains, distribution system and fire hydrants, involving 18,000 ft. 10-12-in. wood and 8,000 ft. 6-8-in. cast-iron pipe.—W. B. Saunders, Engr., Helena.

Mo., Kansas City. 2 p.m., July 9.
Furnishing 30 and 36-in. cast iron specials.—W. G. Goodman, Chief Engr., Fire and Water Board.

N. J., Jersey City. 2 p.m., July 8.
Furnishing cast iron water pipe; also 20 tons water gate boxes and covers and sewer manhole frames and covers.—F. A. Dolan, City Clk.

Wis., Milwaukee. 10.30 a.m., July 3.
House drains and water service connections in city.—P. Braman, Deputy Comr. Pub. Wks.

Ont., Toronto. noon, July 5.
24 and 16-in. cast iron water mains in township of York.—F. Barber, Engr., 40 Jarvis St.

Sask., Saskatoon. noon, July 2.
One 1,000,000-gal. pump and two 4,000,000-gal. pumps, including two switch panels and starting equipment, necessary cabel and piping.—C. J. Yorath, City Comr.

LIGHTING AND POWER.

Ill., Columbia. 2 p.m., June 30.
Improvements to municipal electric light and power plant, involving 100 h. p. H. R. T. boiler and breeching; 100-ft. by 4-in. concrete chimney; 120 h. p. non-releasing Corliss or Uniflow engine; heater, boiler feed pump, pipe work and covering; direct connected A. C. generator, exciter, transformer and switchboard.—Fuller & Beard, Engrs., St. Louis, Mo.

Ia., Storey City. 8 p.m., July 7.
Electric light system.—Henningson Engr. Co., Nat. Bank Bldg., Omaha, Neb.

Ia., Story City. 8 p.m., July 7.
Electric lighting system.—Henningson Engrg. Co., Engrs., Nat. Bldg., Omaha, Nebr.

N. J., Atlantic City. 11 a.m., July 9.
Furnishing illumination of boulevard for period of 5 years.—A. H. Nelson, Co. Engr., 636 Guarantee Trust Bldg.

N. Y., Central Islip. 3 p.m., July 1.
New boiler, stokers, etc., and coal and ash handling equipment at central lighting and heating plant, State Hospital.—Central Islip State Hospital.

O., Lorain. noon, July 2.
Installing water tube boilers and stokers and constructing radial brick chimney at high school boiler house—Watson Engrg. Co., 1101 Hippodrome Bldg., Cleveland.

BRIDGES.

Fla., Jacksonville. July 22.
Bridge across St. Johns River.—County Comrs.

Ind., Richmond. 11 a.m., July 3.
Reinforced concrete bridge with three main arch spans and two approach arch spans.—J. W. Mueller, Leeds Bldg.

Ind., Winamac. noon, July 8.
Three bridges.—J. C. Howe, Co. Aud.

Ind., Kokomo. 2 p.m., July 9.
Reinforced concrete bridge in Center Twp., arch bridge in Ervin Twp., and bridges in Taylor, Honey Creek and Monroe Twps.—Wm. L. Benson, Co. Aud.

Ind., Monticello. 2 p.m., July 8.
Repairing abutment and wing, two abutments and erecting old bridge on two county roads.—F. E. Vinson, Co. Aud.

Ind., Logansport. 10 a.m., July 8.
Repairing and constructing bridges in Clinton, Jefferson, Harrison and Clay Twps.—H. M. Gardner, Co. Aud.

Ind., Columbus. 10 a.m., July 8.
Reinforced concrete bridge in Rockcreek Twp. and one in Sandcreek Twp.—R. Henderson, Co. Aud.

Ia., Pocahontas. 1 p.m., July 2.
Bridges in Pocahontas Co.—A. L. Thornton, Co. Engr.

Ia., Cedar Rapids. 10 a.m., July 15.
6-span concrete steel arch highway bridge over Cedar River and removal of present structure.—Marsh Engrg. Co., Engrs., Des Moines.

Minn., Princeton. 2 p.m., July 14.
Steel and concr. bridge across Rum River.—W. Peltier, Co. Aud.

Minn., Duluth. 1 p.m., July 7.
Two 12-ft. concrete span bridges and one 30-ft. concrete span bridge on State Highway No. 1.—W. H. Borgen, Co. Aud.

Neb., Grand Island. July 15.
800-ft. bridge 16 ft. wide, 16 50-ft. rein. concr. arch spans and 3,000 lin. ft. approach fill.—G. E. Johnson, State Hwy. Dept., Lincoln.

Nebr., Omaha. 11 a.m., July 5.
Small culverts, grading and guard rails, etc., Lincoln Hwy.—F. Dewey, Co. Clk.

N. J., Rahway. 2.30 p.m., July 27.
Concrete and steel beam, 3-span bridge over Rahway River.—J. L. Bauer, Co. Engr., 120 Broad St., Elizabeth.

N. J., Atlantic City. 11 a.m., July 9.
Addition to present highway bridge over Patcong Creek, reconstructing bridge over Indian Cabin Creek, and extending Beach Thorofare Bridge on Pleasantville Blvd.—A. H. Nelson, Co. Engr., 636 Guarantee Trust Bldg.

N. J., Summit. 2.30 p.m., June 27.
Fifty-ft. bridge.—J. L. Bauer, Co. Engr., 120 Broad St., Elizabeth.

FOR MAINTENANCE
USE THE
LITTLEFORD HEATER

No. 69

STRONG
DURABLE
EFFICIENT

This heater has been especially designed for heating small quantities of tar and asphalt for repair and maintenance work on streets and roads. Its compact design and durable construction makes it the most efficient on the market.

Capacity 65 to 165 gallons.

Circulars and Prices on Request.

LITTLEFORD BROS.
451 E. Pearl Street Cincinnati, Ohio

The H & B Paving Brick Testing Machine

N. P. B. M. Standard Rattler

For the Testing of Paving Brick

As we now build this machine it embodies all of the

Latest Improvements

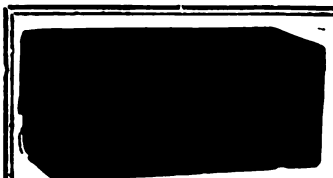
and refinements of construction that have been found desirable during a period of try-out covering almost one year of time and conducted under the direction of the technical committee of the National Paving Brick Manufacturers' Association.

For descriptive circular and prices address

HETHERINGTON & BERNER
INDIANAPOLIS, INDIANA

WHEN YOU WRITE ADVERTISERS YOU WILL DO THEM AND US A FAVOR BY MENTIONING

MUNICIPAL JOURNAL AND PUBLIC WORKS



SERVICE FIRST!
IRONSTONE BLOCK
REPRESSED OR
DUNN WIRE-CUT-LUG
Terre Haute Vitrified Brick Co., Terre Haute, Indiana

STANDARD
Cold Patch Asphalt
SOCONY BRAND

For repairing bituminous macadam roads—economically and lastingly.

Ruts and small holes promptly repaired with Standard Cold Patch Asphalt mean lower maintenance costs now and fewer expensive operations later on.

Its permanency, spreading qualities and ease of application save time, labor and material. Workable the year round.

Other Standard Asphalt Products

Standard Asphalt Binder A for surface treatment.

Standard Refined Mexican Asphalt, for sheet and asphalt paving.

Standard Asphalt Joint Fillers for brick or block pavements.

Standard Paving Flux.

Standard Bridge Asphalt and preserving oils.

Specifications and all other particulars furnished on request.

STANDARD OIL CO. OF NEW YORK
Principal Offices

New York
Albany
Buffalo
Boston

SO SOCONY ASPHALTS AND ROAD OILS

BIDS ASKED FOR

N. Y., Lake George. **12 p.m., July 10.**
300 ft. clear span through truss steel bridge, with wood block pavement, new concrete abutments and wing-walls of 3d class concrete.—Co. Supt. Hways., Warrensburgh, N. Y.

N. Y., Elmira. **11 a.m., July 7.**
Concrete bridge 830 ft. long, with 8 arches over Chemung River.—City Engr., City Hall.

N. D., Jamestown. **2 p.m., July 12.**
Twelve bridges in Stutsman Co.—A. Blewett, Co. Aud.

O., Columbus. **July 7.**
Superstructure of bridge over Big Walnut Creek in Hamilton Twp.—Co. Comrs.

O., Tiffin. **July 5.**
Two bridges in Clinton and Venice Twps.—J. H. Morcher, Co. Aud.

O., Marion. **July 11.**
3 rein. concr. bridges, wool blk. floor for 3 bridges, guard rail and road over bridge, and substructure for bridge.—M. J. Morrall, Chn. Bd. Comrs.

O., Canton. **9 a.m., Jully 14.**
Concr. arch over Nimishillen Creek, also culvert on Cleveland-Massillon road. —W. C. Schick, Clk., Bd. Co. Comrs.

S. D., Oscoma. **July 1.**
Bridges in Lyman Co.—F. E. Olson, Co. Aud.

S. D., Olivet. **July 1.**
Constructing and repairing bridges abutments and approaches.—F. C. Fergen, Co. Aud.

S. D., Onida. **July 8.**
Concrete bridge in Elk Twp.—J. R. Mason, Co. Aud.

S. D., Rapid City. **July 1.**
Bridge in Pennington Co.—A. D. Clift, Co. Aud.

Tex., Abilene. **noon, July 2.**
Two low-riveted truss bridges with concrete floor and approaches; two 100 and 120-ft. concrete dips, 16 ft. wide.—R. S. Fuller, Co. Engr.

Ont., Barrie. **noon, July 4.**
Concrete abutments and concrete floor on bridge over Marl Creek in Simcoe Co. —F. Barber, Cons. Engr., 40 Jarvis St., Toronto.

MISCELLANEOUS.

Cal., Los Angeles. **11 a.m., July 18.**
Silt diversion works near Los Angeles and Long Beach harbors.—U. S. Engr. Office, 725 Central Bld.

Fla., Sanford. **July 7.**
9.18 mi. ditches, involving 58,660 cu. yd. excav.—F. F. Williams, Engr.

Ill., Edwardsville. **July 1.**
Irrigation ditches—Land & Smart, Wright Bldg., East St. Louis, Ill.

Ia., Marshalltown. **2 p.m., July 15.**
Straightening, widening, deepening and changing channel of the Iowa River, 1,400,000 yards.—F. B. Ingersoll, Engr. in Charge.

N. Y., Albany. **noon, July 15.**
Barge canal terminal at Flushing, N. Y. City; furnishing industrial freight-handling trailers and stevedore freight-handling trucks for barge canal terminals.—E. S. Walsh, Supt. Pub. Wks., Albany, N. Y.

N. Y., New York. **noon, June 30.**
Disposing of ashes, street sweepings and rubbish delivered at the waterfront dumps in Manhattan and Bronx.—A. B. McStay, Comr.

N. Y., New York. **Noon, July 2.**
Dredging in Shrewsbury River and Shoal Harbor and Compton Creek, N. J. —U. S. Engr. Office, 39 Whitehall St.

O., Willow. **noon, July 3.**
Pipe covering for boiler equipment for garbage plant.—Chief Archt., 604 City Hall.

Pa., Emsworth. **noon, July 1.**
Locks and dams in Ohio River.—U. S. Engr., Pittsburgh.

Pa., Mechanicsburg. **8 p.m., July 1.**
Furnishing combination motor-driven service truck and necessary equipment. —S. E. Basehore, Secy.

STREETS AND ROADS

Ala., Albany—Work on Albany's $300,000 paving program to be started within 60 days. Lund & Hill, of Little Rock, have been chosen engineers to superintend work, and plans and specifications being rushed.

Ala., Birmingham—The first improvements call for $600,000. As soon as this is secured steps will be taken to secure $200,000 more Federal aid, making total of $1,000,000 to be spent on trunk roads of Jefferson Co. The Lovick, Leeds, Lewisburg, Mt. Pinson, Jasper, South Bessemer and the Bessemer and Fairfield roads were gone over. 36 mi. of roadways to be improved. Foundations for roadways will be concrete. Roadbeds will be paved on 20-ft. width with five ft. on each side macadamized. The roads will be paved with brick in some places.

Cal., Fresno—One million dollars were placed in treasury of Fresno Co. following sale 1,000 newly authorized road bonds for immediate expenditure in construction of the trunk line system of 312 mi. of highway.

Cal., Loomis—$16,000 bond issue to provide gravel road 16 ft. wide over present road from Loomis to Auburn Blvd. carried.

Cal., Napa—The Anglo-London and Paris National Bank of San Francisco has purchased the entire $500,000 bond issue of Napa Co., recently voted for purpose of building concrete highway from Napa to Calistoga.

Cal., Sacramento—Resolutions to pave alley between J and K Sts., from 15th to 16th, postponed to next meeting. Plans and specifications for paving alley between L and M Sts. between 20th and 21st Sts., and resolutions ordering the work, were passed. Resolutions ordering work of pavement on P St., from 2d to 7th Sts., were passed. Plans and specifications for paving Sacramento Blvd., from Fourth Ave. to Eighth Ave., were also postponed. Property owners on U St., between 31st and 34th, asked that that street be paved.

Cal., Sacramento—Merced Co., 15 mi. cement paving between Merced and easterly boundary, James E. Johnston, Tracy, $140,201.60; engineer's estimate, $140,725. Fresno Co., Eight mi of cement paving between Coalinga and Oil King School, Joseph G. Donovan, San Francisco, $128,996.50; engineer's estimate, $111,770.60.

Conn., Danbury—City having plans prepared for paving various streets with sheet asphalt on concrete foundation and napped and reclipped granite blocks on concrete foundation. Election will be held to vote on $100,000 bonds. C. D. Pollock, 13 Park Row, New York City, Engr.

Idaho, Boise City—Federal Govt. will spend $131,000 on 30-mi. stretch of Idaho-Pacific Hwy. in Glenns Ferry Hwy. Dist. To appropriation made by Federal Govt. will be added $131,000 by state and Elmore Co. Aid has been asked on 12-mi. stretch of highway between Mountain Home and the west boundary of the Glenns Ferry highway district. When desired appropriation has been made the entire stretch of state highway from Bliss to Mountain Home will be reduced to minimum grade and graveled.

Ill., Waukegan.—Lake Co. has asked bonds of $370,000 for roads. Bids for bonds to close July 1. A. Henderson Co. Clk.

Ind., Indianapolis—On recommendation of Mr. Lingenfelter, preliminary orders were made for permanent improvement of 44th St., between Washington Blvd. and Pennsylvania St., and of Blackford St., with a two-course concrete roadway, from Washington St. to railroad tracks south of the canal. The board rejected the one bid received for the improvement of the first alley south of 15th St., from the alley east of Hudson St. to Alabama St., as the bid was irregular. A petition for oiling of Belmont Ave., from McCarthy to West Morris St., was referred to A. O. Meloy, St. Comr.

Ia., Burlington—Final action was taken on Sunnyside pavement, and Engr. instructed to advertise for bids. The unimproved side of the street is to be paved to width of 20 ft., with vitrified paving brick on four-in. concrete foundation.

Ia., Decorah—Paving; $100,000. Engr., A. F. Caffeen. M. D. Wells, City Clk. Bids in fall.

Ia., Marshalltown—City Council adopted resolutions of necessity for paving 21½ blocks of streets and 4½ blocks of alleys, making total of 33 blocks so far provided for, including the paving ordered in S. Second and Third Aves. Resolution calls for paving the following streets: N. Fourth Ave., six blocks, 30 ft. wide; N. 6th St., one block, 30 ft. wide; N. 6th St., two blocks, 24 ft. wide; Summit St., two blocks, 30 ft. wide; S. 7th St., two blocks, 24 ft. wide; Boone St., four blocks, 30 ft. wide; North St., one block, 30 ft. wide; W. Main St., 13th St. westward 3¼ blocks, 30 ft. wide; S. 10th St., one blocks, 30 ft. wide.

La., New Orleans—Survey of Hammond-New Orleans Highway is about completed. Construction will soon begin.

Mass., Chicopee—An order appropriating $12,600 for paving School St. with hillside vitrified brick was passed. Orders appropriating $12,500 for National pavement on East St. from present asphalt pavement to Waite St., $37,825 for granite block on West Main St., $52,369 for vitrified brick on Front St.

Minn., Minneapolis—Sale of $1,055,000 in Elwell bonds, proceeds to be used for street improvements, and acceptance of city engineer's plot of proposed paving of Lundale Av. S approved by council. The widening of Mary Pl., widening of 8th St. and widening of Park Av. were principal items of expenditures in Elwell bond proposal. Plan of city engineer for the Lyndale Av. paving called for bitulithic paving from Lake St. to 34th St., and creosote blocks from 34th St. to 42d St. City engineer was directed to submit to council estimate on cost of paving Chicago Ave. from 39th St. to 44th St. with creosote blocks.

Minn., Pipestone—Pipestone Co. decided to bond itself to extent of $250,000 for highway construction.

Minn., St. Paul—Plans and specifications for paving Como Ave., from Rice St. to Great Northern Bridge, approved by City Council. Final orders were approved for paving Berkeley, Standard and Wellesley Aves. and Macalester Ave. Estimated cost of asphalt concrete pavement for this job is $63,282, or $5 a foot.

N. J., New Brunswick—City plans improvement by regulating, grading, paving and curbing of six streets. Streets to be paved with either vitrified brick asphalt block, warrenite on concrete base, concrete sheet asphalt or asphaltic concrete.

Miss., Columbus—In special election qualified electors voted bonds of $50,000 to pave streets in the business section of the city.

Miss., Walthall—Webster Co. has sold road bonds amounting to $250,000. L. D. Hemphill, Clk.

Neb., Fremont—Federal approval of first Lincoln Hwy. paving has been received, and paving of the six-mi. strip of Lincoln Hwy. extending west from Fremont in Dodge Co. will be undertaken at once. This section is to be concrete of Lincoln Hwy. specifications and to cost $30,000 a mi.

N. J., Elizabeth.—Board of Pub. Works passed ordinances for the the paving of 7 streets. Paving to be asphalt concrete on concrete foundation.

N. Y., Newtown—Newtown Local Bd. started proceedings to secure important local improvements by approving following resolutions: Regulating and grading Fisk Ave., 2d Ward; estimated cost, $14,500, or $50 a sq. ft. Regulating, curbing and recurbing where necessary, Centre St., 2d Ward; estimated cost, $640, or 25 cents a front foot. Regulating, recurbing and curbing, where necessary, Stockholm St., 2d Ward; estimated cost, $330, or 50 cents per front foot. Regulating, curbing and recurbing, where necessary, Summerfield St., 2d Ward; estimated cost, $210. Regulating, curbing and recurbing, where necessary, Vandeventer Ave., from Fifth Ave. to Fourteenth, 1st Ward; estimated cost, $3,100. Regulating, curbing and recurbing, where necessary, Ely Ave., from Jamaica to Grand, 1st Ward; estimated cost, $2,800. Construction of a sewer and appurtenances in Laurel Hill Ave., 2d Ward; estimated cost, $3,450.

N. Y., Seneca Falls—Special election will be held July 1 for purpose of submitting a paving proposition to taxpayers of the village. Village Engr. Sidney S. Smith submitted estimates of cost of paving Mynderse St. with brick, and improvement of Green St., from Ovid to White, with concrete. The same mate-

CONNERY'S NON-LEAKABLE—WELDED "HELD BY THE WELD"

Road and Roofing Tar, and Asphalt Heaters and Kettles
All Sizes and Styles

STRONG
DURABLE
PRACTICAL

Other Sizes and Styles if preferred. Write for complete Catalogue and Prices.

STYLE "B"—THE ROAD LEADER
300—400—500 Gallons Capacity

Can be equipped with Warming Hood and Barrel Heist

CONNERY & CO., Inc.
3900 N. SECOND STREET PHILADELPHIA, PA.

No Boiler, Engineer or Fireman is Required for Our Contractor's Pump

It has an extreme high lift, capable of producing 24-inch vacuum. Being double in action, it gives a continuous flow of water. Its two diaphragms being placed vertically, grit cannot lodge and cut them. Working horizontally, it does away with all overhead work. Mounted on solid truck, it is easy to move from place to place. Its compactness reduces needed floor space to only 2x5 feet. Its weight is 1,000 pounds. Has no plunger, plunger packing, stuffing boxes or spring valves.

Our Circular Explains Fully

A. A. PARKER, Front Street, WATERFORD, N. Y.
New England Agents: Perrin, Seamans & Co., 57 Oliver St., Boston, Mass.

Built to Hold and Haul Asphalt

The WATSON asphalt wagon is not an "any old grading wagon" with a steel lining. From wheel-rim to box-brim it is made to hold and haul hot asphalt.

To **hold** it. The WATSON doesn't leave a trail of drippings from plant to job. A bevel-edged iron goes around the lower edges of the body. Against this iron the bottom doors **shut tight**, cutting through any material sticking to the bottom. The body is lined with steel and **interlined with asbestos.**

To **haul** it. The WATSON is built to keep hauling—not to rest for repairs. It is built strong all through—hubs, axles, springs and gears.

The Barber Asphalt Paving Co. and all the other big ones know this—let us prove it to you.

WATSON WAGONS WORK

WATSON WAGON CO.
Canastota, N. Y.

See How It's Built

Conserving Public Funds

Public officers all over the country are saving time and money for the taxpayer and are doing better work with

AUSTIN WESTERN

Road and Street Machinery

because every one of the 250 sizes and styles of Austin Western machines are manufactured in our own factories, under the direction of experts backed by nearly a half-century of experience in the requirements of dependable road and street machinery.

County and Municipal officers should write for the Austin Western catalogue No. 18. It is a handy reference book on all kinds of road machinery and explains the following Austin Western machines.

Road Graders
Rock Crushers
Motor Tandem Rollers
Motor Macadam Rollers
Portable Stone Bins
Stone Elevators
Stone Scrapers
Elevating Graders
Blade Grinders
Dump Wagons
Stone Spreaders
Street Sprinklers
Street Sweepers

The Austin Western Road Machinery Co.
CHICAGO
Branch Offices in 13 Principal Cities

rial will be used on Bridge St., Chapel St. and on Clinton St. Necessary bond issue estimated at $56,000, and that is the amount taxpayers will be asked to authorize. The longest stretch of pavement will be on Clinton St., but improvement of that street is necessary if State Hwy. Dept. is to extend Black Brook Rd. improvement to the village pavements.

N. C., Raleigh—State Hwy. Comn. soon receives bids for sandclaying 73 mi. highway from here to Albemarle. About $200,000. W. S. Fallis, Raleigh, Engr.

N. C., Raleigh—State Hwy. Comn. soon receives bids for paving 6.9 mi. Raleigh-Cary Rd., Wake Co. About $50,000. C. M. Miller, Raleigh, Engr.

O., Bucyrus.—The following paving project will soon be advertised: Bucyrus, 4½ mi. of Lincoln Highway between here and Galion with bituminous macadam at a cost of $32,000 per mile; brick will also be specified.

O., Cincinnati—Hamilton Co. Comrs. will receive sealed bids, July 8, on bond issues of $154,000 and $108,000. Same to cover cost of improvement of Carthage-Hamilton Rd.

O., Cincinnati—City Council received petition for the oiling of two streets.

O., Cincinnati—Hamilton Co. Comrs. propose bond issue of $15,000 to acquire fund for improvement of Carthage-Hamilton Rd.

O., Columbus—City will ask bonds of $300,000 for work of eliminating grade crossings. Election to be held Aug. 12.

O., Dayton—City Commrs. receive petitions for improvement of many streets by grading, paving and laying of sidewalks.

O., Fostoria.—County line road from Marion Rd. east, distance of 4 miles; estimated cost, $38,000.

O., Liverpool—Citizens voted favorably for $100,000 bond issue for road improvement.

O., Toledo—Recently authorized improvements are: Between Perry Twp., in southeast Wood Co., and Seneca Co., on "six-mile line"; cost of $200,000 to be borne by Wood and Seneca counties; between Van Wert and Delphos, 10.3 mi. of Lincoln Hwy.; cost, $293,000; East of Stryker, two mi. of bituminous concrete road, cost $67,261; near Antwerp, four pikes, bonds of $169,000 authorized; York Twp., near Marysville, new stone road, cost $13,000; between Delta and Wauseon, connecting Delta with Toledo-Carragher Rd., completing stretch between Toledo and Bryan; cost $172,000; Washington Twp., near Marysville, three stone roads and fourth stone road in Allen Twp., cost $80,000; in Crawford Co., ten roads, cost $125,000; remaining 6½ mi. of St. Marys-Wapak. main market road, cost $170,278, concrete to be used; resurfacing and repairing of several miles of road in Ottawa Co., near Port Clinton, cost $24,161.40; Put-in-Bay improvements, cost $3,000.

Ore., Portland—All bids for the John Day Hwy. units, and also bid for the Leona-Drain project were rejected and new bids will be advertised for. Commission selected what is known as river highland route for the Mosier-Dalles link of the Columbia River Hwy. It consists of 16 mi., and will be constructed in near future. Thirteen counties, Jackson, Morrow, Gilliam, Lincoln, Yamhill, Benton, Columbia, Clatsop, Deschutes, Baker, Union, Wheeler and Jefferson, asked aid in highway construction, and Comn. assured them of assistance.

Ore., Portland—Nearly 115 mi. of trail, at cost of more than $25,000, will be constructed in Oregon national forest, M. L. Merritt, Forest Examiner, in charge of trails, announced. Principal ones are: Crater National Forest; about 35 mi. along the summit at the Cascades from Crater Lake Park boundary south to Lake of the Woods, at cost of $3,500.

Pa., Ebensburg—Bids will be received until July 5 for $50,000 bonds for road improvement.

Pa., Lower Yoder—Bd. of Supvrs. has $27,000 bonds for road improvement.

S. D., Tyndall—Kingsbury and Bon Homme counties are going in for good road construction. Total amount available for good road construction for Kingsbury Co. is $206,494, which sum will be available for work up to June 30, 1920. There will be total of $346,000 available for good road building in Bon Homme Co. this year. This will be sufficient to construct 17 mi. of hard-surfaced highways.

Tenn., Bristol—Bd. of Comrs. asked sealed bids on bonds of $61,500 for improvement districts No. 9 and 10. Bids to be opened July 8.

Tex., Brenham—Sentiment favoring the good roads bond issue for $1,500,000 for construction and maintenance of system of good roads in Washington county is growing rapidly, and from all indications bond issue will carry.

Tex., Corpus Christi—Comrs.' Court called election on $2,000,000 road bond issue for July 26. Election is called on county-wide basis.

Tex., DeLeon—Comrs.' Court of Comanche Co. has ordered road bond election July 15, of $750,000 for permanent roads.

Tex., Glen Rose—Road bond election assures this precinct fund of $100,000 with which to construct system of hard-surfaced roads.

Tex., Hallettsville—Election in Road Dist. No. 2, in Lavaca Co., for issuance of $200,000 bonds for building highway from Schulenburg to this place, thence to Sweet Home and Yoakum, carried. The highway will connect at Schulenburg with San Antonio-Houston Hwy.

Tex., Hillsboro—Three elections for road bonds carried in this county. Abbott Dist. voted $250,000, Hubbard $300,000 and Bynum $100,000. The Abbott Dist. bond issue assures building of hard-surfaced highway for both the King of Trails and the Colorado-to-the-Gulf Hwy. clear across Hill Co., as Hillsboro and Itasca districts had already voted bonds.

Tex., Rockwall—Rockwall Co., the smallest county in Texas, recently voted bond issue of $800,000 for roads.
dinance to grade, pave and curb Penn Ave., in 13th and 2d Wards, sheet asphalt and stone blocks on concrete base. $35,935. W. A. Schunk, City Engr.

Va., Lynchburg—City Engr. is advertising for bids for proposed improvements to 7th St. These improvements will extend from Main St. to Williams Viaduct and City Engr. estimates that they will cost $8,500. The improvement of Salem St. also in prospect.

Wash., Prescott—City Council passed resolution declaring intention to create a new improvement district within the corporate limits to be known as "Improvement District No. 5," for the purpose of grading and macadamizing 12 city blocks. Tentative plans call for 12-in. macadam 20 ft. wide.

Wash., Seattle—Seven contracts will be awarded by Bd. of Pub. Wks. if satisfactory bids are obtained. West 53d St., by concrete walks, L. I. D. 3193; engineer's estimate, $1,850; Thirty-second Ave. N. W., by paving, L. I. D. 3198; estimate, $69,267.80; Rainier Ave., by paving, L. I. D. 3197; estimate, $140,838; East 50th St., by paving, L. I. D. 3190; estimate, $116,722.80; King St., by paving, L. I. D. 3195; estimate, $197,292.

Wash., Spokane—City Council resolved to proceed with paving of State St. Plans for grading, curbing and draining Cedar St., from Tenth to Fifteenth Aves., were approved. Ordinance was passed vacating 7½ ft. on either side Sherwood Ave., as petitioned.

Wash., Spokane—Council agreed on improvement to be made under the arterial highway act, in which the city and county will bear half. Plans for paving via Riverside Ave. called for building a new concrete bridge across Hangman Creek to replace the present steel bridge. Total length of proposed paving via Hangman Creek Bridge is 4,887 ft. and estimated cost $58,137.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Cal., Sacramento—Bids for building state highway bridge across Salinas River, near King City, in Monterey Co., consisting of 14 spans, reinforced concrete trestle, were opened by State Hwy. Comn. Lowest bidder was Thibbetts Construction Co., of San Francisco, $234,316.90; engineers' estimate, $219,139.75.

***Cal., Yreka (Siskiyou Co.)**—The San Francisco District Forester's Office notified the local forest office of awarding of two contracts for road construction on proposed Happy Camp-Klamath River Rd., the section of 15 mi. near Happy Camp being let to W. A. Bechtel, of San Francisco, for $235,000. This still leaves 26 mi. to Orleans unaccounted for. Nearly all of this road will be hewn out of rocky mountainsides. Another contract for 7½ mi. between Orleans and Somes Bar, in Humboldt Co., has been let to William B. Arndt, of San Francisco, for $150,000.

Ill., Springfield—Bids received by Division of Hwys., June 18, on Federal and State-aid roads. All bids are for concrete pavement unless otherwise stated. Federal-aid: Cook Co., Sec. B—Peerless Engineering & Construction Co., 1121 Chamber of Commerce, Chicago, Ill., $102,173.39; Ready & Callaghan Coal Co., 133 W. Washington St., Chicago, Ill., $97,820.19; J. Black Masonry & Contracting Co., Telephone Bldg., Chicago, Ill., $114,514.39; Warner Construction Co., 189 W. Madison St., Chicago, Ill., $111,917.94; R. F. Conway Co., Chicago, Ill., concrete, $120,270.40; bituminous concrete, C1, $157,433.20.; bituminous concrete, C, $148,761.88. Cook Co., Sec. C—Warner Construction Co., Chicago, Ill., $157,910.60; R. F. Conway Co., Chicago, concrete, $163,590.83; C1, $202,498.01; C, $192,771.17; J. Black Masonry & Contracting Co., Telephone Bldg., Chicago, $162,551.56. Will Co., Sec. D—Warner Construction Co., 189 W. Madison St., Chicago, Ill., $126,767.71; R. F. Conway Co., Chicago, concrete, $122,587.20; bituminous concrete, C1, $155,883; bituminous concrete, C, $148,113.98; R. H. Newkirk, 299 Barber Bldg., Joliet, Ill., $115,748.55; J. Black Masonry & Contracting Co., Telephone Bldg., Chicago, $131,419.23; Holm-Page Co., Rockford, Ill., $115,751; Powers-Thompson Construction Co., Joliet, Ill., $112,019.75. Combination, Cook Co., Secs. B and C, and Will Co., Sec. D—R. F. Conway Co., Chicago, concrete, $364,000; bituminous concrete, C1, $497,000; bituminous concrete, C, $473,000; J. Black Masonry & Construction Co., $366,000. Sec. 3, Dixie Hwy., Iroquois Co.—Warner Construction Co., 189 W. Madison St., Chicago, Ill., $151,435.81; Bates & Rogers Construction Co., Chicago, $216,162.30. Sec. M, Mason Co.—Bates & Rogers Construction Co., $19,925.77; H. K. Rhodes, Lincoln, Ill., $20,238.80. Sec. I, Effingham Co.—C. J. Moritz, Inc., West Allis, Wis., $99,700.59. Sec. J, Effingham Co.—C. J. Moritz, Inc., West Allis, Wis., $57,333.31. Sec. K, Effingham Co.—C. J. Moritz, Inc., West Allis, Wis., $53,842.26. Sec. M., Effingham Co.—J. Black Masonry & Contracting Co., Telephone Bldg., Chicago, $93,819.27; Wm. C. Weneely Co., Frankfort, Ind., $135,915.45; W. F. Smith & Co., Rensselaer, Ind., $117,446.94. Sec. N, Effingham Co.—J. Black Masonry & Contracting Co., Telephone Bldg., Chicago, $134,092.37; Wm. C. Meneely Co., Frankfort, Ind., $176,874; W. F. Smith & Co., Rensselaer, Ind., $150,587.62. Combination, Sections M and N, Effingham Co.—W. F. Smith & Co., Rensselaer, Ind., $250,534.30. Sec. L, Effingham Co.—Earthwork and culverts, A. M. Hoolan, 607 Wainright Bldg., St. Louis, Mo., $132,408.74. Sec. G, 15-d, Effingham Co.—C. J. Moritz, Inc., West Allis, Wis., $84,384.53. State-aid Roads: Sec. D, Edwards Co.—Gravel, Schernekan & Son, West Salem, Ill., $3,426.79. Sec. D, Fulton Co.—Concrete, Sutton & Rhodes, Canton, Ill., $15,800.* Sec. F, Ogle Co.—Concrete, Gunn-Graham Co., Freeport, Ill., $19,983.26.† Sec. K, McHenry Co.—Concrete, W. A. Jaicks, River Forest, Ill., $9,155.84.† Sec. L, McHenry Co.—Concrete, W. A. Jaicks, $9,989.52. Sec. I, Macoupin Co.—Earth, Miller & Husband, Springfield, Ill., $2,200.

***Ind., Evansville**—Western Construction Co. was awarded contract by Bd. of Pub. Wks. for improvement of Virginia St., from Sixth Ave. to Garfield St. A bid of $2.75 per sq. yd. of asphalt submitted. Bd. will receive bids June 27 for building of sewer in Garvin St.

***Ind., Indianapolis**—Five street improvement contracts awarded by Bd. of Pub. Wks. on recommendation of F. C. Lingenfelter, City Engr. The Marion Co. Construction Co. received following contracts, all of which are for resurfacing with asphalt: Senate Ave., 6.35 a ft., total $11,086.60; Senate Ave., $7.70 a ft., total $28,139.56; Kentucky Ave., $7.60 a ft., total $18,586.62, and Maryland St., $7.30 a ft., total $12,922.65. The American Construction Co. received contract for resurfacing Washington St. at $10.55 a ft., total of $63,095.55. The two companies were the low bidders.

***Ind., Laporte**—Contract for construction of the Louis C. Bartholomew Rd. in Michigan Twp., Laporte Co., has been let at $87,475 to Municipal Contracting & Supply Co., Gary, Ind.

***Ind., Laporte**—Contract for a road in Michigan Twp., Laporte Co., has been let at $33,580 to Municipal Contracting & Supply Co., Gary, Ind.

Ia., Des Moines—Paving contracts have been let by the City Council. O. P. Herrick awarded contract for S. E. 11th St. at 4.90 per sq. yd. for vitrified brick. Des Moines St., from E. 4th to E. 5th, and University Ave., from 17th to 20th Sts., will also be paved with brick, both contracts going to G. G. Herrick, the former at $4.29 a sq. yd. and latter at $4.39.

The Improved Merriman One-Car Steam Melting Asphalt Plant

A Merriman Plant in Operation

will handle more asphaltic material than any other plant; and will do it better, and at less cost. The steam melting process makes it impossible to burn or coke the asphalt, and eliminates the possibility of burning the kettle bottoms. It also produces a better, longer-wearing mixture than direct fire heat.

The new plant measures only 55 feet over all. It is easy to transport, and easy to dismantle and set up. Has extra large hot-material bin and large mixer; two large melting kettles—a day's run in each. Each unit can be operated separately.

Write today for full information

East Iron & Machine Co., Lima, Ohio

Can be laid on old macadam, concrete, old brick, rolled stone or slag foundations.
An Asphaltic Concrete Pavement with pulverized slag as chief mineral aggregate. An economical roadway of proved success.

BITOSLAG

Reg. U. S. Patent Office
The Pavement That Wears Like Iron
BITOSLAG PAVING COMPANY
90 WEST STREET, NEW YORK

Our experts will give full information as to the proper preparation of the mixture, and testing from time to time free of charge.
Correspondence invited.

CUMMER PORTABLE ROAD ASPHALT PLANTS (3 Units)

750, 1250 and 1800 yards 2″ top daily or other standard mixtures
EASY CAPACITY OVER 100 IN OPERATION
PLANTS IN STOCK FOR PROMPT SHIPMENT
THE F. D. CUMMER & SON CO. CLEVELAND, OHIO

KOPPEL
CARS and TRACK USED EVERYWHERE FOR ECONOMICAL ROAD BUILDING
LOCOMOTIVES, CARS, PORTABLE TRACK, Switches, Frogs, Rails, Spikes, Ground Throws, Turntables, STEEL BATCH BOXES FOR DIRECT CHARGING USED IN CONCRETE ROAD CONSTRUCTION.
FOR SALE OR FOR RENT
KOPPEL INDUSTRIAL CAR AND EQUIPMENT CO.
Purchaser of: Orenstein-Arthur Koppel Company
First German Enterprise Sold by Alien Property Custodian
Plant: KOPPEL, PA.
SALES OFFICES:
NEW YORK CHICAGO PITTSBURGH SAN FRANCISCO
Our Catalogues, Estimates and Expert Engineering Advice are Free for the Asking
KOPPEL

***Ia., Des Moines**—Paving contracts aggregating approximately $500,000 awarded by City Council. The projects with yardage and prices are as follows: Sixth Ave., from School to Franklin St., 25,187 sq. yds., at $3.29, to Warren Bros.; Easton Blvd. and E. 18th St., 35,500 sq. yds., at $3.35, to Warren Bros.; E. 29th St., from Easton Blvd. to city limits, 19,476 sq. yds., at $3.45, to Warren Bros.; Indianola Rd., from S. W. 7th St. bridge to city limits, 32,474 sq. yds., at $3.29, to Carey & Sons; E. University Ave., from E. 33d St. to the city limits, at $3.19, to Carey & Sons.

Ia., Waterloo—Bids for drainage and paving contracts of Federal Aid Project on Whitney Rd. were opened by Bd. of Supvrs. First bid on paving opened was that of Bryant Paving Co., Waterloo, which included following items: Excavating, $13,344.80, with each type of paving; type A, concrete, $3.15 sq. yd., $149,-621.85; type B, concrete, $3 sq. yd., $142,-497; monolithic brick, $3.70 sq. yd., $175,746.30; bit. filled brick, $4.15 sq. yd., $192,370.95; sheet asphalt, $3.97 sq. yd., $189,046.02. The second bid was that of Moore Young Construction Co., Waterloo, as follows: Type A, $3.10; type B, $2.97; monolithic brick, $3.60; bit. filled brick, $2.90.

***La., New Orleans**—Douglas, Burt and Buchanan, of Shreveport, with bid of 27 cents a cu. yd., were awarded contract by Louisiana State Bd. of Engrs. to enlarge line of south bank of Cypress Creek between Boggy Bayou and Lucca Landing. The contract is one of the largest let for levees, the stretch being about six mi. long and new work totalling $1,200,000 cu. yds. of earth. There were three other bidders, as follows: Hercules Co., New Orleans, 29.33 cents; John and A. C. Glassell, Shreveport, 35.91, and Grant, Smith and Locher, Glasgow, Va., 42 cents.

***Mass., Boston**—The Eastern Road Construction Co. has been mentioned for contract to lay more than 2½ mi. of road between Taunton and Norton.

Mass., Pittsfield—Massachusetts Hwy. Comn. opened bids on resurfacing of three-mi. stretch of Hancock-West Pittsfield Rd. There were ten bidders, and the lowest figure, which was $169,450, was presented by Carl B. Lindholm, of this city. Second lowest bid, $170,010, was by Davis & Brock, of Brookline. Road is to be rebuilt with cement surface eight inches in the center, six inches at the side and 18 feet wide.

***Minn., Virginia**—Contract for the Virginia end of new road which will connect this city with Eveleth awarded the Lawrence-McCann Co., of Eveleth, at a price of $3.89 per cu. yd. Work on this highway will be started at once. Eveleth Council will award contracts for its share of work soon, and the preparing of the roadbed and laying of the concrete will be carried on from both ends at the same time.

***Mont., Missoula**—Contract for building 22.8 mi. of standard highway from Missoula to Lewiston, Idaho, awarded Carlson-Norman Co., of Spokane, for $153,347.

***N. J., Irvington**—Union Ave., Springfield Ave. to Mt. Vernon Ave., approximately 11,800 sq. yd. 5x12x2 inch "Hastings" asphalt blocks, $56,669. Contract awarded John Dorer, Irvington, N. J.

***N. J., South Orange**—Irving Ave., Centre St. to Grove Rd., 4,470 sq. yd. 5x12x 2-inch "Hastings" asphalt blocks, $24,-246.40. Contract awarded Jos. Selitto, South Orange, N. J.

***N. J., South Orange**—Valley St. to south village line, 9,300 sq. yd. 5x12x2-inch. "Hastings" asphalt blocks, $48,024. Contract awarded Ludwig Batt, South Orange, N. J.

***N. Y., Buffalo**—Contract for road in Erie Co. awarded Cold Spring Construction Co., 878 Ellicott Sq., at $184,925. Contract for curbing and asphalt repaving three streets awarded H. P. Bugard Co., at $89,835; 1, to German Rock Asphalt Co., Inc., at $6,770.

***N. Y. (Long Island), Mineola**—Bd. of Supvrs. awarded two contracts for improvement of two county roads to R. G. Meserole, of Locust Valley. One for furnishing of material and labor for improvement of Black Road Hill, in Glen Cove City, and other for resurfacing macadam road from Burnett's Corner at Locust Valley toward Bayville, 12,000 ft., at cost of $1.35 per sq. yd. W. F. Starks, Engr.

***N. Y., Yonkers**—The State Hwy. Comr. opened bids for number of state road improvement jobs. One was in Westchester Co., and estimates as follows: E. T. Eggleston, Yonkers, N. Y., $18,-800.80; Good Roads Eng. & Contg. Co., Port Chester, N. Y., $20,297; Greenwich Contg. Co., Inc., New York City, $20,-426.50; Fleming, O'Brien, New York City, $20,775; James Ciarcia, Mt. Vernon, N. Y., $21,900; Hughes & Gardner, North Tarrytown, N. Y., $21,924.

***N. Y., Yonkers**—Bd. of Contract and Supply awarded several contracts for curbing city streets and trenching work. The Totten Construction Co. was awarded three bids. Following are the bids: Trenching and refilling for water pipes on Ellison Ave.: F. A. Cianfaglione, $1,264.10; Joseph L. Cuozzo, $703.40; James J. Hart, Inc., $812.90; Fred Graham, $565.20; Totten Construction Co., $550. Contract awarded Totten Construction Co. Trenching and refilling for water pipes in Central St.: F. A. Cianfaglione, $466; J. J. Hart, Inc., $410; Joseph L. Cuozzo, $309.96; Totten Construction Co., $206. The same company was awarded contract. Construction of curbs on Beach St.: F. A. Cianfaglione, $1,812.70; J. J. Hart, Inc., $1,593.56; James Kearns, Jr., $1,928.20; William Hopper, $1,704.10; Fred Graham, $1,826.-70; Totten Construction Co., $1,611.94; Hannifin Construction Co., $1,907.40. Contract was awarded J. J. Hart. Construction of curbs on Radford St.: Hannigan Contracting Co., $3,433.45; William Hopper, $2,895.93; James J. Hart, $3,-101.35; James Kearns, Jr., $3,988; F. A. Cianfaglione, $3,665.65; Fred Graham, $3,622.40; Totten Constructing Co., $3,-199.35. Contract awarded William Hopper. Curbs on Post St.: Hannifin Contracting Co., $3,689.56; William Hopper, $3,137.18; F. A. Cianfaglione, $3,965.90; J. J. Hart, Inc., $3,508.29; James Kearns, Jr., $4,232; Fred Graham, $3,884.70; Totten Constructing Co., $3,465.64. Awarded to William Hopper. Curbs on Cottage Pl. and on Wood Pl.: F. A. Cianfaglione, $2,611.65; James J. Hart, Inc., $2,327.10; James Kearns, Jr., $2,660.20; Totten Construction Co., $2,251.44. Awarded Totten Construction Co.

***Ore., Portland**—Contracts awarded as follows: Monroe project, 9 mi. grading and paving, Pacific Bridge Co., $214,368; Baker-Cornucopia, 4.65 mi. grading, Morrison-Knudson Co., $42,924.40; Grand Rande-Butler's Store, William Trent, $16,170; Echo-Pendleton, 21.4 mi. grading, Johnson Contract Co., $192,013.50; Cabbage Hill-Kamela, 26.8 mi. grading, Dalrymple & Ackerman, $117,874.50; Bertha-Washington Co. line, 2.43 mi. paving, Warren Construction Co., $67,291; Green Springs-Mount Summit, 10.9 mi. grading, A. Gerbisch, $114,570.50; Green Springs-Jenny Creek, 8.15 mi. grading, Jackson Co. Court, at cost; Roseburg-Wilbur, 4.5 mi. grading, H. J. Hildeburn, $21,721; Hubbard Creek-Burns Creek, 6.94 mi. grading, Moon & Co., $157,590; Marshfield-Cedar Point, slide removals, Coos Co. Court, at cost; Cedar Point to Coquille, 1.9 mi. grading, Moon & Co., $10,640; Aurora-Canby, 3.8 mi. grading, W. B. Tull, $34,401.

Pa., Ebensburg—Bids were opened for contract of construction one mile of brick road on concrete base, commencing at north bank of Clearfield Creek, at Dysart, and extending one mi. towards Patton. Road will be 16 ft. in width. Nupp & Bee, of Starford, Indiana Co., submitted the only bid, which was $56,-291.18. Bids also opened for construction of one mile of brick road, on concrete base, beginning at intersection of township road and State Hwy. Route No. 221, Clearfield Twp., one-half mi. east of Patton, and extending in an eastward direction to Dysart. Bids submitted were as follows: Gifford & Prichard, Philipsburg, $48,900.05; Nupp & Bee, $50,-302.65; John Dandree, Patton, bid not tabulated, but said to be in the neighborhood of $65,000.

Pa., Harrisburg—Following bids received June 17 for road construction: Blair Co., Logan Twp., Route No. 221, 23,075 ft. repair work, bituminous surface course—Warren Bros. Co., Boston, Mass., (D) $29,410; Eastern Paving Co., Philadelphia, Pa., (B) $27,200. Blair Co., Gaysport Boro., Route No. 53, 890 ft. reinforced concrete—Standard Construction Co., Altoona, Pa., $5,872.70. Bradford Co., Athens Twp., Route No. 287, 6,640 ft. plain concrete—T. H. Gill Co., Binghamton, N. Y., $38,890.60; Valley Construction Co., Athens, Pa., $38,540.65; Warren-Moore & Co., Philadelphia, Pa., $52,073.52. Cambria Co., Jackson Twp., Route No. 314, 32,185 ft. reinforced concrete hillside vitrified brick—The Nichola Bldg. Co., Pittsburgh, Pa., $259,953.50; Claiborne-Johnston Co., Baltimore, Md., $378,174.29. Centre Co., Boggs Twp., Routes Nos. 107 and 219, 27,940 ft. reinforced concrete or bituminous surface course on a concrete foundation—Vipond Construction Co., Altoona, Pa., $215,-710.50; Claiborne-Johnston Co., Inc., Baltimore, Md., $253,412.70; The Gaylord International Engrg. & Cont. Co., Scranton, Pa., $219,952.15. Chester Co., Oxford Boro., Route No. 131, 2,932 ft. reinforced concrete or bituminous surface course on a concrete foundation—The Juniata Co., Philadelphia, Pa., $21,601.50; Sutton Contracting Co., Inc., Philadelphia, Pa., $22,231.10; Henry E. Baton, Philadelphia, Pa., $24,527.70. Crawford Co., Hayfield and Woodcock Twps., Route No. 84, 9,067 ft. reinforced concrete—Mason, Hilton & Co., N. Y. City, $85,-813; Keystone Construction Co., Meadville, Pa., $62,626.50. Cumberland Co., Upper Allen Twp., Route No. 128, 24,275 ft. reinforced concrete and hillside vitrified brick—Langthorn Co., Inc., N. Y. City, $181,604.95; Hamilton Kapnek Const. Co., Philadelphia, Pa., $181,642.31; MacArthur Bros. Co., N. Y. City, $234,-887.45. Erie Co., Mill Creek and Fairview Twps., Route No. 272, 27,409 ft. reinforced concrete and hillside vitrified brick, or bituminous surface course on a concrete foundation and hillside vitrified brick—Warren Bros. Co., Boston, Mass., (D) $299,319.36; The Campbell Bros. Co., Youngstown, Ohio, $237,684.43; Gaylord International Engrg. & Const. Co., Scranton, Pa., (B) $255,513.34. Erie Co., Girard Boro. and Girard Twp., Route No. 86, 4,854 ft. bituminous surface course on a concrete foundation and vitrified brick—Mayer Bros. Const. Co., Erie, Pa., (B) $86,633.95; The Gaylord International Engrg. & Const. Co., Scranton, Pa., (B) $97,227.21; Warren Bros. Co., Boston, Mass., (D) $101,948.94. Erie Co., Wayne Twp., Application No. 829, 20,200 ft. reinforced concrete—Highway Construction Co., Erie, Pa., $136,532.35; Keystone Construction Co., Meadville, Pa., $141,-387.64; Elmer M. Love & Son, Corry, Pa., $155,977.76. Lancaster Co., E. & W. Hempfield and Manheim Twps., Route No. 129, 37,684 ft. reinforced concrete or bituminous surface course on a concrete foundation—Freeland Construction Co., Freeland, Pa., $247,272,96; Jas. McGraw Co., Philadelphia, Pa., $248,803.15; Warren Bros. Co., Boston, Mass., (D) $302,-027.84. Lycoming Co., Platt and Woodward Twps., Route No. 23, 39,319 ft. reinforced concrete—Hugh Nawn Contracting Co., Philadelphia, Pa., $433,761.10; Langthorne Co., Inc., N. Y. City, $329,-919.13; W. J. Gephart, Pittsburgh, Pa., $322,830.71. Mercer Co., Grove City Boro., Route No. 73, 3,678 ft. reinforced concrete or bituminous surface course on a concrete foundation—Brackenridge Sand & Gravel Co., Brackenridge, Pa., $44,168.10. Potter Co., Roulette and Eulalia Twps., Route No. 101, 26,400 ft. reinforced concrete or bituminous surface course on a concrete foundation—Louis H. Gipp, Buffalo, N. Y., $218,918; Horn & Devling, Galeton, Pa., $22,743.10; Winston & Co., Kingston, N. Y., $241,-674.68. Warren Co., Youngsville Boro., Route No. 88, 6,544 ft. reinforced concrete—Joseph McCormick & Bro., Erie, Pa., $39,906.50; Martin Dolan, Jamestown, N. Y., $47,650; Thomas Arrigo, Charleroi, Pa., $64,689. York Co., Carroll and Franklin Twps., Route No. 123, 40,712 ft. reinforced concrete and hillside vitrified brick or bituminous surface course on a concrete foundation and hillside vitrified brick—Mason & Hanger Co., Inc., Chambersburg, Pa., $319,702.07; Eastern Paving Co., Philadelphia, Pa., (B) $338,615.81; Langthorne Co., Inc., N. Y. City, $297,908.

***Tenn., Bristol**—Contract for construction of McDowell St. awarded Municipal Paving and Construction Co., street to be built according to specifications set down in special ordinance. The street is to be built of reinforced concrete at width of 20 ft. with a curb. City agrees to pay construction company $2 per sq. yd. for the constructing, with grading extra. Street is about 1,800 ft. long.

***Wash., Spokane**—Construction of a standard highway from Koskia to Lowell, Idaho, awarded by Government to Carlson-Norman Co., of Spokane; award was $155,000. The highway will be 22.8 mi. in length and will become part of the system to connect Missoula, Mont., with the Clearwater country by way of Lo Lo Pass. There will be considerable rock work.

***Wash., Spokane**—The Bd. of Public Service awarded contracts for improvement of six streets, as follows: Thrush Ave., Skrainka Construction Co., $53,-199.25; Alcott Ave., James E. Perkinson, $49,800.10; Claxton St., Skrainka Construction Co., $20,502.35; Leahy Ave., James E. Perkinson, $11,087.10; Minnesota Ave., Eyermann Construction Co.,

D. C., Washington—The following bids were received by the chief engineer of the Washington Suburban Sanitary District on Contract No. 1, June 9. The contract was awarded to Hampton & Fedeli, 502 Union Savings Bank Bldg., Washington, D. C., being the lowest bidder. The highest bidder was D. C. McAleer, 405 Phoenix Bldg., Baltimore, Md. Other bidders were: Piel Construction Co., 2546 Edmondson Ave., Baltimore, Md., $29,895.43; Baker & Chapman, 1318 Eutaw Pl., Baltimore, Md., $29,137.59; Ryan Construction Co., Westport, Baltimore, Md., $42,550.91; W. H. Angle, Hagerstown, Md., $37,145; Whiting-Turner Const. Co., Stewart Bldg., Baltimore, Md., $37,678.45; G. W. Ensign, Inc., Hershey Bldg., Harrisburg, Pa., $35,495.61; Christhilf & Ensey, 688 Munsey Bldg., Baltimore, Md., $33,762.84.

Abbreviations: G. W. I., Galvanized Wrough Iron—Excav. & Ref., Excavation & Refill—B. & S., Bell & Spigot—Cem. Jts., Cement Joints—Pl. Jts., Plastic Joints—H. C., House Connections—W. Ser., Water Service—Br., Branch—Lay., Laying—Excl., Exclusive—Conc., Concrete—Stdp., Standpipe—Fr., Frame—Bldg., Building—Fish., Flushing—D. C., Drop Connections—U. D., Underdrain—F. H., Fire Hydrant—M. H., Manhole—Conn., Connection—Fur. Mat., Furnishing Materials—V. P., Vitrified Pipe—Corp. Cock, Corporation Cock—Inc., Including—V. Bx., Valve Box—G. V., Gate Valve—C. I., Cast Iron.

Item and Unit.	Quantity.	Hampton & Fedeli, Rate.	Hampton & Fedeli, Total.	D. C. McAleer, Rate.	D. C. McAleer, Total.	Engineer's Estimate. Rate.	Engineer's Estimate. Total.
6-in. water main, excav. and ref., 5 ft. or less, lin. ft..	1,400	$.50	$700.00	$2.04	$2,856.00	$.38	$532.00
8-in. water main, excav. and ref., 5 ft. or less, lin. ft..	2,710	.50	1,355.00	2.28	6,178.80	.41	1,110.10
6-in. water main, excav. and ref., 5 ft. to 7 ft., lin. ft.	434	.50	217.00	2.60	1,128.40	.44	190.96
8-in. water main, excav. and ref., 5 ft. to 7 ft., lin. ft.	400	.50	200.00	2.95	1,180.00	.47	188.00
6-in. sewers, excav. and ref., lin. ft.	2,117	.98	2,074.66	2.50	5,292.50	.67	1,418.39
8-in. sewers, excav. and ref., lin. ft.	3,162	.98	3,098.76	2.50	7,905.00	.69	2,181.78
10-in. sewers, excav. and ref., lin. ft.	554	2.00	1,108.00	2.50	1,385.00	.71	393.34
Excav. and earth ref.—below subgrade, cu. yds.	25	1.25	31.25	1.25	31.25	1.25	31.25
Excav. and gravel ref.—below subgrade cu. yds.	10	3.25	32.50	3.25	32.50	3.25	32.50
6-in. water mains, Class B, C. I. fur. and lay., ton.	3	74.50	223.50	80.00	240.00	75.00	225.00
8-in. water mains, Class B, C. I. fur. and lay., ton.	20	79.80	1,596.00	80.00	1,600.00	72.00	1,440.00
6-in. water mains, Class C, C. I. fur. and lay., ton.	31	81.60	2,529.60	80.00	2,480.00	75.00	2,325.00
8-in. water mains, Class C, C. I. fur. and lay., ton.	60	77.80	4,668.00	80.00	4,800.00	72.00	4,320.00
B. & S. special castings, fur. and lay., ton	4	134.00	536.00	135.00	540.00	150.00	600.00
6-in. V. P. sewer, cem. jts., fur. and lay., lin. ft.	1,993	.24	478.32	.40	797.20	.30	597.90
8-in. V. P. sewer, cem. jts., fur. and lay., lin. ft.	3,026	.34	1,028.84	.45	1,361.70	.40	1,210.40
10-in. V. P. sewer, cem. jts., fur. and lay., lin. ft.	50	.49	24.50	.80	40.00	.58	29.00
6-in. V. P. sewer, pl. jts., fur. and lay., lin. ft.	100	.30	30.00	.55	55.00	.35	35.00
8-in. V. P. sewer, pl. jts., fur. and lay., lin. ft.	100	.40	40.00	.60	60.00	.45	45.00
10-in. V. P. sewer, pl. jts., fur. and lay., lin. ft.	504	.70	352.80	.95	478.80	.63	317.52
6-in. C. I. pipe sewer, Class A, fur. and lay., lin. ft.	24	1.50	36.00	3.50	84.00	1.15	27.60
8-in. C. I. pipe sewer, Class A, fur. and lay., lin. ft.	36	2.00	72.00	4.00	144.00	1.95	70.20
¾-in. G. W. I. W. Ser., fur. and lay., inc. excav. and ref., 4 ft. or less, lin. ft.	400	.48	192.00	.75	300.00	.43	172.00
1-in. G. W. I. W. Ser., fur. and lay., inc. excav. and ref., 4 ft. or less, lin. ft.	650	.54	351.00	1.00	650.00	.48	312.00
¾-in. G. W. I. W. Ser., fur. and lay., inc. excav. and ref., 4 ft. to 6 ft., lin. ft.	100	.49	49.00	1.00	100.00	.45	45.00
1-in. G. W. I. W. Ser., fur. and lay., inc. excav. and ref., 4 ft. to 6 ft., lin. ft.	150	.55	82.50	1.35	202.50	.50	75.00
¾-in. corp. cock and goose neck, fur. and placing, each	35	3.00	105.00	5.00	175.00	10.00	350.00
1-in. corp. cock and goose neck, fur. and placing, each	60	4.00	240.00	6.00	360.00	12.00	720.00
5-in. or 6-in. V. P. H. C. cem. jts., inc. excav. and ref., 6.5 ft. or less, lin. ft.	900	.64	576.00	2.15	1,935.00	.80	720.00
5-in. or 6-in. V. P. H. C. cem. jts., inc. excav. and ref., 6.5 ft. to 7.5 ft., lin. ft.	600	.66	396.00	2.38	1,428.00	.92	552.00
5-in. or 6-in. V. P. H. C. cem. jts., inc. excav. and ref., 7.5 ft. to 9 ft., lin. ft.	200	.74	148.00	3.20	640.00	1.15	230.00
5-in. or 6-in. V. P. H. C. cem. jts., inc. excav. and ref., 9 ft. to 11 ft., lin. ft.	50	.88	44.00	5.70	285.00	1.36	68.00
5-in. or 6-in. V. P. H. C. pl. jts., inc. excav. and ref., 6.5 ft. or less, lin. ft.	100	.74	74.00	2.30	230.00	.85	85.00
5-in. or 6-in. V. P. H. C. pl. jts., inc. excav. and ref., 6.5 ft. to 7.5 ft., lin. ft.	50	.76	38.00	2.53	126.50	.97	48.50
5-in. or 6-in. V. P. H. C. pl. jts., inc. excav. and ref., 7.5 ft. to 9 ft., lin. ft.	50	.84	42.00	3.35	167.50	1.20	60.00
5-in. or 6-in. V. P. H. C. cem. jts., inc. excav. and ref., 9 ft. to 11 ft., lin. ft.	25	.98	24.50	5.85	146.25	1.41	35.25
5-in. or 6-in. V. P. stop. cem. jts., fur. and bldg., excl. of conc., lin. ft.	25	.75	18.75	2.00	50.00	1.00	25.00
Lumber in foundations, M. ft. B. M.	2	60.00	120.00	80.00	160.00	75.00	150.00
Sheeting or shoring, left in place, M. ft. B. M.	1	60.00	60.00	60.00	60.00	60.00	60.00
Brick masonry, cu. yds.	1	25.00	25.00	28.00	28.00	25.00	25.00
Conc. masonry, Class B, cu. yds.	5	14.00	70.00	20.00	100.00	12.00	60.00
Conc. masonry, Class C, cu. yds.	25	12.00	300.00	18.00	450.00	10.00	250.00
On 5-in. or 6-in. V. P. B. R. in addition to straight pipe, each	100	.60	60.00	.50	50.00	.45	45.00
On 8-in. V. P. B. R. in addition to straight pipe, each.	100	.74	74.00	.80	80.00	.65	65.00
On 10-in. V. P. B. R. in addition to straight pipe, each.	15	.85	12.75	1.25	18.75	1.00	15.00
6-in. U. D., fur. and lay., lin. ft.	300	.74	222.00	1.25	375.00	.60	180.00
F. H., fur. and setting, each.	13	85.00	1,105.00	100.00	1,300.00	80.00	1,040.00
6-in. G. V., fur. and setting, each.	13	26.00	338.00	28.00	364.00	23.00	299.00
8-in. G. V., fur. and setting, each.	4	36.00	144.00	40.00	160.00	33.00	132.00
V. B. X. for 6-in. or 8-in. G. V., fur. and setting, each.	17	10.00	170.00	8.00	136.00	8.00	136.00
M. H. fur. and bldg., excl. of fr. covers, steps, fish. and D. C., lin. ft.	150	8.00	1,200.00	7.50	1,125.00	8.00	1,200.00
Setting M. H. fr. and covers, fur. by Commission, each.	18	2.00	36.00	4.50	81.00	1.00	18.00
Setting M. H. steps, fur. by Commission, each.	100	.05	5.00	.25	25.00	.10	10.00
1-in. fish. cock in M. H., fur. and setting, each.	1	2.00	2.00	10.00	10.00	5.00	5.00
On 6-in. sewer, Type "A," D. C. in M. H., fur. and bldg., each	1	7.00	7.00	20.00	20.00	8.50	8.50
On 8-in. sewer, Type "A," D. C. in M. H., fur. and bldg., each	1	8.00	8.00	25.00	25.00	9.50	9.50
On 10-in. sewer, Type "A," D. C. in M. H., fur. and bldg., each	1	9.00	9.00	30.00	30.00	10.50	10.50
On 6-in. sewer, Type "B," D. C. in M. H., fur. and bldg., each	2	10.00	20.00	20.00	40.00	9.50	19.00
On 8-in. sewer, Type "B," D. C. in M. H., fur. and bldg., each	2	12.00	24.00	25.00	50.00	10.50	21.00
6-in. blanked V. P. conn., fur. and setting, each.	3	1.00	3.00	1.00	3.00	2.60	7.80
8-in. blanked V. P. conn., fur. and setting, each.	1	1.00	1.00	1.00	1.00	3.00	3.00
Total without working days.			$26,829.23		$50,175.65		$24,588.99
Number work. days at $25.00		40 days	1,000.00	35 days	875.00	50 days	1,250.00
Total with work days.			$27,829.23		$51,050.65		$25,838.99

$15,547.25; Walsh St., Eyermann Construction Co., $40,164.

***Wash., Seattle**—Paving of J. B. McDougal road and extension, 1.87 mi. of concrete roadway, 16 ft. in width, will cost King Co. $47,904. Bd. of King Co. Comrs. awarded to Seaboard Construction Co., Seaboard Bldg., a contract for the work, this firm having submitted the lowest of four bids received. The bidders and bids submitted follow: Seaboard Construction Co., $47,904; Kaiser Paving Co., $48,310; J. L. Smith, $50,922; G. A. Ferguson, $51,400. Co. Engr. Sam Humes' estimates of the cost of the work were: Concrete, $45,174.60 and brick, $62,802.60. The contract as let involves the laying of 17,628 sq. yds. of concrete surfacing.

***Wash., Spokane**—The assessment roll for the retaining wall, fill, drain and one board sidewalk on Trent Ave., between the two river bridges, confirmed by ordinance. Contract awarded some time ago to DeCamp Bros. & Hughes, who are now proceeding with the work. The construction contract calls for $23,550, and total cost, including engineering and collecting expense, is $24,360.

***Wash., Vancouver**—Warren Construction Co., of Portland, was granted contract on Sarah-Ridgefield Rd. B. L. Dorman, Engr. of Clark Co.

Wis., Racine—The bids for asphalt paving were slightly below estimates, while the brick paving bids were somewhat above the figures. Following were the bids received for paving: Grange Ave., from Wright Ave. to St. Paul Railroad—Western Impvt. Co., sheet asphalt, $2.67 per sq. yd.; brick, $3.12; asphaltic concrete, $2.39; curb and gutter, 79 cents. Osborne Blvd., from Kinzie Ave. to Graceland Blvd.—Western Impvt. Co.; Trinidad, $2.77; brick, $3.12; asphaltic concrete, $2.49; v. f. brick, $3.08; curb and gutter, 82 cents. Howland Ave.—James Cape & Sons Co., asphaltic macadam, $2.60; curb and gutter, 82 cents; cement walk, 25 cents; lowering water mains, 60 cents; lowering water service, 50 cents; lowering water mains, $1; lowering water service, $1. 10th St.—Western Improvement Co., asphaltic concrete, $2.46; curb and gutter, 82 cents. Hilker Pl.—Western Improvement Co., asphaltic concrete, $2.48; curb and gutter, 84 cents.

SEWERAGE AND SANITATION

Cal., Bishop—A. D. Schively, town clk., rejected bids received building sanitary sewerage system and sewage treatment tank. About $35,000. New bids will soon be received. Olmsted & Gillelen, 1112 Holligsworth Bldg., Los Angeles, Engrs.

Cal., Los Angeles—City voted $135,000 bonds to build sewerage system, including pumps, sewers, etc., in Wilmington Dist. W. T. Knowlton, City Engr.'s Office, Engr.

Ida., Twin Falls—See "Streets and Roads."

Ill., Chicago—City to have new intercepting sewer to be built on northwest side of the city, costing $1,103,000.

Ill., East Moline—Voters will decide whether new sewer pumping station and improvements to cost $25,000 shall be built or not.

Ind., Laporte—City contemplates extension of sewers and water mains. City Engr., B. P. Thomas.

Ia., Davenport—Sewer extension plans have been prepared. Hugo Moeller, City Clerk.

Iowa, Dysart—Plans in progress for sewerage system. Owner, Town of Dysart. Engr., Nathaniel Barber, Waterloo.

Iowa, Pocahontas—Will take bids soon for sewer, septic tank and filter beds. Estimate about $37,000. G. H. Kiefer, City Clk.

La., Natchitoches—Sanitary sewer system will probably be installed in this city. Address Mayor.

Mass., Chicopee—Extension sewer work was put under way by passage to second reading of orders appropriating $1,075 for sewer on Sunnymeade Ave.; $3,362 for a sewer on Caroline St.; $400 for a sewer on Laurel St.; $620 for a sewer on Duncan St.; $1,450 for a sewer on Edwards St., and $700 for a sewer on Mary St.

Mass., Springfield—City asks bids until June 24 on bond issue of $50,000 for sewers.

Mass., Wellesley (Boston P. O.)—Metropolitan Water and Sewer Bd., Boston, had plans prepared for extending concrete truck sewer two mi. About $225,000. F. D. Smith, 1 Ashburton Pl., Boston, Engr.

Minn., Duluth—Special election will be held July 1 for issuance of $7,000,000 bonds for hard surfacing roads in St. Louis county.

Miss., Jackson — See "Streets and Sewers."

Miss., Jackson.—Bond issue of $100,000 for sewer system and street improvements will soon be voted on. Chairman of City Commission.

Mont., Lewistown—City plans to build sewers in Storm Sewer Dists. Nos. 5 and 6. About $8,000 and $62,000 respectively. R. P. Longshore, Lewistown, Engr.

Mont., Cut Bank—City has awarded bonds of $48,000 for construction of sewer system.

Mo., Kansas City—Resolution adopted providing for immediate building of Turkey Creek sewer, a $150,000,000 project. Bids to be advertised at once.

Neb., Columbus—City will build storm sewers in Dist. No. 3.

Neb., Friend—Bond issue for sewer system with disposal plant will soon be voted on.

Neb., Lincoln—City Clk. T. H. Berg will receive bids until July 2, for $100,000 bonds for sewer construction.

Neb., Nebraska City—Carried at election $52,487 sewer bonds.

N. Y., Binghamton—Common Council adopted ordinances to build storm sewers in State and Mill Sts. and sanitary sewers in Broad Ave., Louisa, Clifford and Abbot Sts. About $80,000. U. E. Weller, City Engr.

N. Y., Binghamton—The first section of intercepting sewer will be built this year Comrs. have decided. John A. Giles, Comr. of Pub. Wks.

N. Y., Rochester—Bids asked on $80,000 bond issue for sewers. Bids close June 25.

N. H., Manchester—There is demand for a new general sewerage system, as already recommnded by City Engr.

O., Youngstown—Ordinance authorizing City Auditor to borrow $305,000 to pay cost of constructing Mill Creek district sewer passed under suspension of rules. A number of ordinances for sewer and paving work have also passed Council.

Okla., Idabel—Sewers, $70,000. Engr. Benham Engrg. Co., 1300 Concord Bldg., Oklahoma City, Okla. T. J. Bookout, City Clk. Plans completed.

Okla., Pawhuska—City voted bonds of $79,380 for sewer extensions.

S. C., Andrews—City plans to lay two-thirds mi. vitrified sewer mains in various streets, also build sewage disposal plant. About $50,000. Tomlinson Eng. Co., Loan & Exchange Bank Bldg., Columbia, Engrs.

S. D., Lemmon—At special election the voters authorized issuance of bonds for installing sewerage system. Steps will be taken to have system installed at earliest possible date.

Tenn., Alton Park—City authorized bond issue of $140,000 for sewer system. Theo. F. King, chairman of City Commission.

Va., Woodstock—Voted $30,000 sewer bonds May 29.

Wash., Yakima—Extension of city's sewer system will cost $344,300, according to estimate submitted by City Engr. C. F. Wilson.

Wis., Madison—Council will ask bond issue of $20,000 to cover cost of improvements to be made in city sewage disposal plant.

Wyo., Cheyenne—Special election will be held July 29 to vote on issuance of bonds of $300,000 for construction of sanitary and storm sewers.

Alta., Calgary—City Council appropriated $350,000 bonds for sewage disposal plant, $28,439 bonds for sewer in Centre St., and $16,000 bonds for sewer in Kilarny St.

Ont., St. Catharines—City having plans prepared by W. P. Near, Engr., City Hall, building sanitary sewers and sewage disposal plant. About $50,000.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

***N. J., Roselle Park**—Bids for construction of five lateral sewers were opened at Council meeting and contract for construction of sewers was awarded Martin & Miller Co., at $9,926.30, this being the lowest bid.

***Mich., Ironwood**—Work was commenced on construction of 1,800 ft. of 18-in. and 1,400 ft. of 12-in. sewer mains by Oxnam & Son, the successful bidders for new sewer to be laid through business section of the city. Contract price with Oxnam is $13,425. There were three other bids submitted, the highest bid being that of Hall & Labby, who were willing to do the work for $28,566.

N. J., New Brunswick—David Cohen and Patrick Moran were the only bidders for construction of sanitary sewers on several streets of the city. Mr. Cohen, who is a new contractor in the city, was low on all streets by a wide margin. Bids were as follows: Patrick Moran—8-in. vitrified pipe sewer in Comstock St., $2.55 per lin. ft.; Comstock St., $2.10 per lin. ft.; Delevan St., $3.27 per lin. ft.; Townsend St., $2.55 per lin. ft.; Powers St., $2.27 per lin. ft.; 8x5-in. Y branch in addition to price for sewers, $2.10 each; for manholes not over six ft. deep, complete, $72 each; for each foot of manholes in excess of six feet, $12 per ft. David Cohen—Comstock St., $2.19 per lin. ft.; Comstock St., $1.77 per lin. ft.; Delevan St., $2.35 per lin. ft.; Powers St., $2.29 per lin. ft.; 8x5 Y branch in addition to price for sewer, 80 cents each; manholes not over six feet deep, complete, $55 each; each ft. of manholes in excess of six feet, $7 per lin. ft.

N. Y. (Long Island), Port Jefferson—Bids received by Port Jefferson Sewer Comrs. for building of sewage disposal system. Lowest bids follow: Leo E. Kelly, Brooklyn, $21,926.80; Claire D. Schlemmer, Islip, $24,174.80; New York Sewage Disposal Co., Manhattan, $18,858.80.

WATER SUPPLY

Ala., Gadsden—Municipal waterworks system will be extended at cost of $13,000 or more. The Mayor.

Ark., Booneville—A water works system to be constructed. Address City Clk.

Ark., Cotton Plant—New water works to be constructed. Address Clerk of Village.

Ariz., Mesa—City election July 8 to vote on $35,000 bonds to build extensions to waterworks system.

Col., Grover—A $34,000 bond issue has been voted for water works, etc.

Ind., Crothersville — Construction of water works system under consideration. Address George A. Harrop, South Bend, Ind.

Ind., Hammond—Plans being made for filtration plant in connection with water works, cost of which will be $400,000.

Ind., Laporte—See "Sewerage."

Ia., Clinton—An election on establishing municipal water works system will soon be held.

Kan., Hiawatha—New pumps and other improvements planned for water system, about $25,000.

Mass., Chicopee—City considering the expense of $66,000 for erection of standpipe.

Mich., Pontiac—City voted $126,000 bonds to extend waterworks system. H. H. Barnett, City Engr.

Minn., Fairmont—A newly developed section asks for water main extension. Pres. of Council.

Minn., Hinckley—City plans to build addition to water and sewerage systems. About $55,000. L. P. Wolff, Guardian Life Bldg., St. Paul, Consulting Engr.

WATER WORKS EQUIPMENT

APPROVAL

HERSEY DETECTOR METER

The Hersey Detector Meter has been accepted for thirteen years in 3", 4", 6", 8", 10" and 12" sizes without any restrictions or conditions of any kind by every Insurance Company, Stock and Mutual, doing business in the United States, and by the Water Departments and Water Companies in more than 600 Cities and Towns for use on over 4,000 Fire Services protecting over $2,000,000,000 worth of Insured Property.

HERSEY MANUFACTURING COMPANY

BOSTON NEW YORK CHICAGO COLUMBUS, O

PHILADELPHIA ATLANTA SAN FRANCISCO

"Turnkey Jobs"

Our Service is Complete, as our organization includes Engineers, Field Construction Forces and Factory Facilities which puts the burden of getting results on us—Hence the Guarantee

"Water, or No Pay"

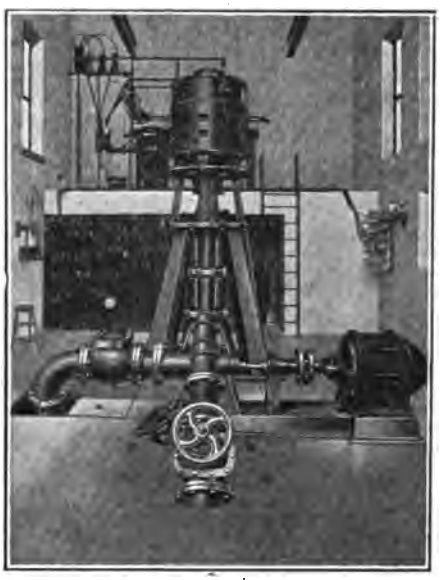
We Write It in the Contract

Write today for Information and Free Literature.

Layne & Bowler Company

"World's Largest Water Developers."

759 Randolph Building
Memphis, Tenn.



SERVICE AND FIRE PROTECTION

Layne Deep Well Turbine Pump ordinarily operating against service pressure by-passing horizontal Turbine. Horizontal Turbine is cut in for fire pressure.

Saves Coal

Cuts Costs

The point of the Luitwieler story of pumping economy is the cam principle. Gives steady power. No jar or backlash. Saves fuel and labor. Takes wheeze and strain out of pumping—cuts repairs and depreciation. Hundreds of city and private water plants have tried the principle and swear by it.

"We speak with authority"

Why and proof in Catalogue 14.

LUITWIELER PUMPING ENGINE CO.
ROCHESTER N.Y.

NEW YORK CHICAGO

Keystone Arctic
Keystone Compound
Eureka Utility

COLUMBIA, S.C. KANSAS CITY

Water Meters

Pittsburgh Meter Co.
East Pittsburgh, Pa.

LOS ANGELES SEATTLE

THE X-RAY FOR PUBLIC WATER SYSTEMS

DID YOU SEE OUR AD
IN THE ISSUE OF JUNE 14

It told a story of water waste and the means of preventing it by a COLE RECORDER.
Write for particulars

The Pitometer Company
27 Elm Street NEW YORK

SLUICE GATES
Shear, Flap and Butterfly Valves
FLEXIBLE JOINTS
COLDWELL-WILCOX CO
Box 574 NEWBURGH, N. Y.

Mont., Bonner—Missoula Light and Water Co. has begun work of much importance at its plant at Bonner, improvements being made which will cost $80,000 and which will not be completed before next winter. Four large deep water gateways, constructed of cast iron, are to be built in the dam, though before they are installed it will be necessary to construct a cofferdam above the section of the dam where the gates are to be installed.

N. J., New Brunswick—Bd. of Comrs. adopt resolution authorizing the installation of meters on consumers' services throughout the city. Cost to be $40,000, for which bonds will probably be issued.

N. Y., Athens—Plans for proposed water works are under way.

N. Y., Malone—City election soon to vote on $30,000 bonds to lay 2 mi. 12-in. pipe line from Shepherd Bridge to reservoir, to increase daily flow to 1,500,000 gal. A. Handley, Clk.

N. Y., New Rochelle—On recommendation of Chief of Fire Dept., approved by Fire Comn. and Council Fire and Water hydrant Committee, hydrants were ordered installed as follows: One at Lorenzen Ave. and Halcyon Rd.; one in Coligni Ave.; one in Lake Drive.

N. Y., Oswego—Capt. Traband, U. S. Q. M. C. has recommended to Government expenditure of $60,000 for changing water system at Madison Barracks. There has been considerable trouble with present pumping station and improvements, which include a partial gravity system at the intake, will overcome all these difficulties.

N. C., Statesville—City plans to build two filters and one clear water basin, lined with concrete, 750,000 gal. capacity. About $150,000. R. L. Greenlee, Statesville, Engr.

N. C., Zebulon—Vote recently taken in favor of water works bond issue for $65,000.

O., Amsterdam—The village of Amsterdam, of which G. F. Waggoner is mayor, will vote July 12 on bond issue of $50,000 for constructing sanitary waterworks and fire protection system.

O., Canton—Election called for Aug. 12 to vote on bond issue of $1,252,000 for water works.

O., Fremont—Bond issue of $15,000 for better water supply will be submitted to voters Aug. 12.

O., St. Clairsville—A bond issue of $65,000 for construction of modern water system has been carried; bids to be advertised very shortly.

Okla., Pawhuska—City voted bonds of $238,053 for water works extensions.

S. C., Eau Claire—Issuance of $40,000 municipal bonds for constructing waterworks system, installing pumping and filter station, may be voted. The Mayor.

S. C., Lake City—City contemplates waterworks installation.

Tex., El Paso—City planning improvements to cost in round figures about $500,000. Proposed betterments include water works, approximately $100,000; resurfacing of streets, $50,000; paving, $100,000; sewerage, $25,000; scenic drive, $150,000; parks, $100,000.

Alta., Calgary—Expenditure of about $1,000,000 authorized by City Council for extension of water supply and other municipal improvements.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

***Ia., Burlington**—Contract for construction of Drainage Dist. No. 8 of Des Moines Co. Drainage System was granted to Grundon Bros. & Glick, of Fort Dodge, Ia. Bid of that concern for the construction of levee district was $28,500. The building of the district will reclaim 3,500 acres of land. The company bid 16 cents a cu. yd. for work in Section 1 and 29 cents a yd. for work in Section 2 of the district. The bids were well below any of the other firms.

***N. J., Jersey City**—City Commissioners awarded John T. Brady Co. contract for laying of additional water main between Boonton and Lyndhurst for $2,100,000. Brady was the lowest formal bidder.

***O., Canton**—A million-gal. reservoir will be built in the Union Dam site in the southwest end. Contract was awarded Keller E. Huff on bid of $38,505 by City Bd. of Control. Bids for a 750,000 and a million-gal. basin were also received and Huff was lowest of six bidders on both estimates.

O., Canton—Bids opened for proposed sedimentation station to be erected by city in Union dam field were around the estimate of cost of the basin. Bids for both a 750,000 and a million-gal. reservoir were received. Keller E. Huff submitted lowest estimates. Bids are as follows: Keller E. Huff, for 750,000-gal. basin, $30,620; for million-gal. basin, $38,505; to be completed in 90 or 100 days, respectively. Melbourne Bros. Contracting Co., $32,798.50 and $41,046. To be completed in 65 to 75 days respectively. E. J. Landor, $34,159 and $43,140.50. To be completed in 120 and 160 days, respectively.

LIGHTING AND POWER

Fla., Bowling Green—City called special election on July 1 to vote on issuance of bonds for $20,000 to cover cost of construction of new electric distributing system and water works.

Ga., Bowman—Will vote June 25 on $10,000 electric light bonds.

O., Cleveland—City Council passed ordinance to appropriate $300,000 for extension of municipal electric light and power system.

Ill., Vienna—Council is planning to install up-to-date power plant. Address City Clk.

Ia., Waukon—See "Streets and Roads."

Kans., Chanute—Election will be called in near future to vote $65,000 bonds for extension and improvement of electric lighting system. C. G. Wood, City Clk.

Kan., Kansas City—Bids opened by Kansas side Comr. for new equipment for municipal electric light plant. The half-million dollars in bonds are to pay cost.

Mass., New Bedford—Municipal Hospital Construction Committee discussed advisability of the hospital having its own power plant. Expected cost, $20,000 to $25,000.

Minn., Ely—Question of issuing $66,000 light and water bonds will be submitted to vote. Address J. Wisted, Jr., Town Clk.

Miss., Coldwater—Issuance of $10,000 municipal bonds for installing street lighting system voted. S. D. Wooten, Mayor.

N. Y., Schenevus—Bd. of Vil. Trustees recently authorized issuance of bonds for $22,000 to provide for cost of construction of new electric light plant and transmission system through town of Maryland to town of Milford. Board recently filed application with Public Service Comn. for necessary permission for proposed construction work.

O., Northfield—Sum of $35,000 bonds issued for electric light equipment. Current to be furnished by Northern Ohio Traction & Light Co.

O., Wellington—$50,000 bonds has been voted to install lights and power plant. Address Town Clk.

Okla., Pawhuska—On June 19 city voted $67,567 bonds for electric light extensions.

Pa., Warren—City needs new service ladder truck. Address president of council.

S. D., Vermilion—Bond issue of $60,000 for electric light now available.

Va., Hampton Roads—Navy Dept. is taking bids for construction of new electric distributing system at local Government site. Proposed work will cost $60,000.

Wis., Port Washington—City Council is considering issue of $30,000 bonds for extending and improving the electric light system. Address City Clk.

FIRE

Ill., Danville—City Clk. was authorized by resolution adopted by Council to advertise for bids on an aerial truck with proper nozzles and equipment, a combination pump and hose truck, and a combination hose and chemical truck.

Ill., Hillsboro—City planning to buy fire-fighting apparatus.

La., Covington—Considerable addition to equipment of Fire Dept. is planned. Address Chief.

Md., Princess Anne—Funds have been raised with which to purchase apparatus for volunteer fire company of this place.

Mass., Hyannis—New motor apparatus and fire alarm system will probably be installed very soon. Walter Chase, Clk.

Mich., Houghton—Committee appointed by Council to make careful survey of fire department with view of making necessary improvements and adding new equipment. Improvements proposed will cost $9,000, exclusive of equipment. The committee consists of Village Trustees Smith, Hill and Rashleigh.

Mo., Webb City—Bond issue for Fire Dept. building and equipment now available. L. O. Walker, City Clk.

N. J., Hillside (P. O. Elizabeth)—Committee appointed to investigate matter of fire protection. Town is now dependent on Elizabeth's fire department and wants proper apparatus at home. Address George Compton.

N. Y., Buffalo—City will spend about $60,000 on fire department. Address City Comr. C. M. Hearld.

N. Y., Hornell—Arrangements being made to motorize entire department. Address Chief Fire Dept.

N. Y., Jamestown—Fire Committee of Council recommends purchase of motor apparatus for three stations. Address Chairman of Committee.

N. Y., Newark—Fire wardens plan to secure additional motor apparatus. Address Chief, Fire Dept.

O., Amsterdam—See "Water Supply."

O., Bluffton—Council considering more extensive fire protection and equipment, consisting of motor truck with a force pump, is being favorably considered together with equipment costing $36,000.

O., Cincinnati—Mayor Galvin states that he will take up with Bd. of Control and various city experts recommendations made by experts of fire underwriters for improvements in city's fire fighting system. Experts have recommended establishment of pumping station in connection with the high pressure fire main system. Five stations it is recommended should be discontinued, dependent, however, on the motorization of fire department, which is recommended.

O., Elyria—Ordinance to issue bonds of $20,000 for improvement of East Side fire department, and to purchase additional fire apparatus for central station and for East Side station has passed first reading.

O., Elyria—Council has passed bond ordinance providing for issue of $20,000 to purchase new fire apparatus.

Okla., Tulsa—City has been authorized by Mayor and Bd. of City Comrs. to advertise for bids for additional fire equipment needed with the building of fire stations in West Tulsa and Kendall. Four pumpers, one double chemical wagon and one water tower constitute equipment that will be specified in the bidding blanks. Police and Fire Comr. Bohm will suggest that entire equipment be purchased from one company and that hereafter all fire fighting apparatus purchased be bought of the same kind.

Pa., Connellsville—Plans and specifications for remodeling city hall have been accepted. Plans provide ample room for new fire equipment and larger force. Arrangements for new equipment will now be taken up.

Pa., Duquesne—Another fire truck may soon be bought. Pres. of Council.

Pa., East Pittsburgh—This boro. is considering purchase of fire equipment. Address Secy., Bd. of Trade.

Pa., Summit Hill—Council voted to install complete fire alarm system to cost $75,000.

Tex., Texas City—Council passed order for election, July 12, on bond issue of $10,000 for fire station on Rose Hill.

Quality and Service

are both assured when you buy

Liquid EBG Chlorine

the 100% Sterilizing Agent

Read This!

"We wish to express our satisfaction with the quality of gas which we have had this past year, and also for the service rendered. Under great shipping difficulties we have been able to get our supply regularly and with one exception always had a small reserve.

"This means a great deal to us in water sterilization."

We invite your inquiries and request for Booklet, "The Wise Cities."

ELECTRO BLEACHING GAS COMPANY

Pioneers and Leading Manufacturers of Liquid Chlorine

PLANT: NIAGARA FALLS, N. Y.

Main Office: 18 East Forty-first Street, New York City

CHICAGO OFFICE: 11 South La Salle Street

Canadian Representatives:
General Supply Company of Canada, Ltd., Ottawa, Toronto, Montreal, Winnipeg, Vancouver

Look for the RED Cylinder

A Meter Well Bought is Not Half Set

We believe that the curb is the only logical place for a water meter, for the following reasons:

A.—Meter is safe from frost damage.

B.—Meter is safe from tampering.

C.—Consumer is always at home to reader and in consequence inspector will read many more meters per day than with basement settings.

D.—The reader is relieved of any temptation to record fictitious readings because of consumer's absence from home.

E.—The liability of admitting a burglar under guise of a meter reader is avoided.

F.—All water entering property is registered and leaks on inside piping will be promptly repaired.

G.—Meter is less liable to damage from hot water backing up from range boiler when located at curb.

H.—Ordinary curb box and curb stop may be done away with if desired.

There are a lot of other reasons and meter boxes are cheap. Write us.

FORD METER BOX COMPANY, Wabash, Indiana

OFFICIAL ADVERTISING

Pennsylvania State Highway Department, Harrisburg, Pa.—Sealed proposals will be received at the State Capitol until 10:00 A. M., July 8, 1919, when bids will be publicly opened and scheduled and contract awarded as soon thereafter as possible for the reconstruction of the following pavements: 45,051 linear feet of either Bituminous Surface Course and Hillside Vitrified Brick on a Concrete Foundation or Reinforced Concrete in Bradford County; 14,883 linear feet of either Bituminous Surface Course on a Concrete Foundation or Reinforced Concrete in Bucks County; 41,673 linear feet of Reinforced Concrete and Hillside Vitrified Brick in Butler County; 12,355 linear feet of either Bituminous Surface Course on a Concrete Foundation or Reinforced Concrete in Centre County; 30,995 linear feet of Reinforced Concrete and Hillside Vitrified Brick in Clearfield County; 2,903 linear feet of either Bituminous Surface Course on a Concrete Foundation or Reinforced Concrete in Clinton County; 24,900 linear feet of either Bituminous Surface Course on a Concrete Foundation and Hillside Vitrified Brick or Reinforced Concrete and Hillside Vitrified Brick in Delaware County; 30,197 linear feet of Reinforced Concrete and Hillside Vitrified Brick in Fayette County; 46,297 linear feet of Reinforced Concrete and Hillside Vitrified Brick in Lehigh County; 22,705 linear feet of Reinforced Concrete and Hillside Vitrified Brick in Luzerne County; 80,363 linear feet of Reinforced Concrete and Hillside Vitrified Brick in Somerset County; 30,335 linear feet of Reinforced Concrete in Susquehanna County; 17,412 linear feet of either Bituminous Surface Course and Hillside Vitrified Brick or Reinforced Concrete in Sullivan County; 28,831 linear feet of either Bituminous Surface Course on a Concrete Foundation and Hillside Vitrified Brick or Reinforced Concrete in Tioga County; 32,047 linear feet of Reinforced Concrete and Hillside Vitrified Brick in Westmoreland County; 71,063 linear feet of either Bituminous Surface Course on a Concrete Foundation or Reinforced Concrete in Lackawanna and Wyoming Counties, and 32,744 linear feet of Reinforced Concrete and Hillside Vitrified Brick in York County. Bidding blanks and specifications may be obtained free and plans upon payment of $2.50 per set, upon application to State Highway Department, Harrisburg. No refund for plans returned. They can also be seen at office of State Highway Department, Harrisburg; 1001 Chestnut Street, Philadelphia, and 904 Hartje Building, Pittsburgh, Pa. LEWIS S. SADLER, State Highway Commissioner.

Bids received until July 1, 1919.

Highway Work

Office of the State Commission of Highways
ALBANY, N. Y.

Sealed proposals will be received by the undersigned at their office, No. 55 Lancaster Street, Albany, N. Y., at 1:00 o'clock P. M. on Tuesday, the 1st day of July, 1919, for the improvement of the following highways:

ALBANY—One highway—3.93.
HERKIMER—Two highways—5.84 and 5.67.
ONEIDA—One highway—0.45.
PUTNAM—One highway—3.33.
SARATOGA—Two highways—9.06 and 1.52.
SUFFOLK—Two highways—6.59 and 4.99.

Also for the completion of the following highways:

CATTARAUGUS—One highway—6.98.
CAYUGA—Two highways—3.89 and 4.39.
CORTLAND—One highway—6.07.
ERIE—One highway—6.03.
FRANKLIN—One highway—1.99.
HAMILTON—One highway—5.01.
JEFFERSON—One highway—4.05.
MADISON—One highway—5.65.
NIAGARA—One highway—8.00.
SCHENECTADY—One highway—5.62.
WAYNE—One highway—5.85.

And also for the repair of the following highways:

RENSSELAER — One contract — reconstruction.
ULSTER—One contract—resurfacing.

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Commission in Albany, N. Y., and also at the office of the division engineers in whose division the roads to be improved, completed or repaired are located. The addresses of the division engineers and the counties of which they are in charge will be furnished upon request.

The special attention of bidders is called to "General Information for Bidders" on the itemized proposal, specifications and contract agreement.

FREDERICK STUART GREENE,
Commissioner.

ROYAL K. FULLER, Secretary.

Notice of the Sale of Water Works Bonds

NOTICE OF THE SALE OF MUNICIPAL COUPON BONDS OF THE CITY OF CASPER, WYO.

Notice is hereby given that the City Council of the City of Casper, Wyoming, will issue and negotiate under, and in accordance with, the provisions of Chapter 129 of the Wyoming Compiled Statutes, 1910, 260 coupon bonds of said city, in the amount of $260,000, for the purpose of constructing, extending the system of water works, to supply said city with water for the extinguishment of fires, and for supplying the inhabitants thereof with water for domestic, manufacturing and other purposes, such bonds to be dated the 30th day of April, 1919, and to be of the denomination of one thousand dollars ($1,000) each, and shall bear interest at the rate of five per cent. (5%) per annum, interest payable semi-annually, payable at the office of the City Treasurer in the City of Casper, Wyoming, or at the banking house of Kountze Brothers in the City of New York, State of New York, such bonds to be redeemable after fifteen (15) years and payable in thirty (30) years after the date they are issued, and such bonds shall be sold for not less than the par value thereof.

The City Council of the City of Casper reserves the right to reject any and all bids and sell the same at private sale, if they deem it for the best interests of the city.

Sealed bids will be received until 8:00 o'clock P. M. on the 30th day of June, A. D. 1919, at which time they will be opened at the Council Chambers in said City of Casper.

All bids must be accompanied by certified check in the amount of five per cent. (5%) of the bid, payable to J. S. Van Doren, Treasurer of the City of Casper, Wyoming, as evidence of good faith on the part of the bidder.

Bids should be addressed to Asa F. Sloane, Clerk of the City of Casper, Wyoming, and marked "Sealed Proposals for the Purchase of Bonds."

Dated at Casper, Wyoming, May 23, 1919.
(Seal) JOHN F. LEEPER, Mayor.
Attest: ASA F. SLOANE, City Clerk.

Notice of Sale of Sewerage Bonds

NOTICE OF SALE OF MUNICIPAL COUPON BONDS OF THE CITY OF CASPER, WYO.

Notice is hereby given that the City Council of the City of Casper, Wyoming, will issue and negotiate under, and in accordance with, the provisions of Chapter 131 of the Wyoming Compiled Statutes of 1910, sixty (60) coupon bonds of the said City of Casper of the denomination of one thousand dollars ($1,000) each, bearing interest at the rate of five per cent. (5%), payable semi-annually, both principal and interest payable at the office of the City Treasurer of the City of Casper, Wyoming, or at the banking house of Kountze Brothers in the City of New York, State of New York, said bonds to be numbered from one (1) to sixty (60), inclusive, each to be dated the 30th day of April, 1919, and to become payable in twenty (20) years after that date, and to be redeemable by the City of Casper at any time after ten (10) years after that date, said bonds to be issued for the purpose of providing funds for the building of sewerage in said City of Casper.

Said bonds shall not be sold for less than their par value, and the City Council of the City of Casper reserves the right to reject any and all bids, and sell the same at private sale, if they deem it for the best interests of said city.

Sealed bids will be received until 8:00 o'clock P. M. on the 30th day of June, A. D. 1919, at which time they will be opened at the Council Chambers in the said City of Casper.

All bids must be accompanied by certified check in the amount of five per cent. (5%) of the bid, payable to J. S. Van Doren, Treasurer of the City of Casper, Wyoming, as evidence of good faith on the part of the bidder.

Bids should be addressed to Asa F. Sloane, Clerk of the City of Casper, Wyoming, and marked "Sealed Proposals for Purchase of Bonds."

Dated at Casper, Wyoming, May 23, 1919.
(Seal) JOHN F. LEEPER, Mayor.
Attest: ASA F. SLOANE, City Clerk.

Notice of Sale of Bonds

NOTICE OF SALE OF MUNICIPAL COUPON BONDS OF THE CITY OF CASPER, WYO.

Notice is hereby given that the City Council of the City of Casper, Wyoming, will issue and negotiate under, and in accordance with, the provisions of Chapter 29 of the Session Laws of Wyoming, 1915, ninety-eight (98) coupon bonds of said city, in the amount of $49,000, such amount not exceeding one per cent. (1%) of the assessed valuation of the said City of Casper, for the purpose of erecting and constructing a building in said City of Casper, for the housing of its fire extinguisher equipment, and for the use of its fire department and town officers in the transaction of their official business, such bonds to be dated the 30th day of April, 1919, and to be of the denomination of five hundred dollars ($500) each, and shall bear interest at the rate of five per cent. (5%), interest payable semi-annually, payable at the office of the City Treasurer in the said City of Casper, or at the banking house of Kountze Brothers in the City of New York, State of New York, such bonds to be redeemable after ten (10) years, and payable in thirty (30) years after the date they are is-

sued, and such bonds shall be sold for not less than the par value thereof.

The City Council of the City of Casper reserves the right to reject any and all bids, and sell the same at private sale, if they deem it for the best interests of said city.

Sealed bids will be received until 8:00 o'clock P. M. on the 30th day of June, A. D. 1919, at which time they will be opened at the Council Chambers in said City of Casper.

All bids must be accompanied by certified check in the amount of five per cent. (5%) of the bid, payable to J. S. Van Doren, Treasurer of the City of Casper, Wyoming, as evidence of good faith on the part of the bidder.

Bids should be addressed to Asa F. Sloane, Clerk of the City of Casper, Wyoming, and marked "Sealed Proposals for the Purchase of Bonds."

Dated at Casper, Wyoming, May 23, 1919.

(Seal) JOHN F. LEEPER, Mayor.

Attest: ASA F. SLOANE, City Clerk.

TREASURY DEPARTMENT, Supervising Architect's Office, Washington, D. C., June 12, 1919.—Sealed proposals will be opened in this office at 3:00 P. M., July 10, 1919, for furnishing and delivering at the site the materials required for the construction of the United States Post Office Building at Vinton, Iowa, including materials for concrete, reinforced concrete, stone, granite, brick, structural terra cotta, structural steel, miscellaneous iron and steel work, composition roofing, slate roofing, sheet metal work, skylights, plastering, interior marble, sanitary slate, lumber, millwork, painting, glazing, hardware, plumbing, heating, electric work, etc. Bills of quantities and specifications may be obtained from the Custodian of the Site at Vinton, Iowa, or at this office, in the discretion of the Supervising Architect. JAS. A. WETMORE, Acting Supervising Architect.

Bids received until July 15, 1919.

Paving

POTTSTOWN, PA.

Sealed proposals will be received for 28,715 square yards of vitrified brick paving on concrete foundation. Bids to be filed on or before July 15, 1919, with the undersigned, who will furnish specifications on application.

M. L. SEASHOLTZ,
Borough Clerk, Pottstown, Pa.

Bids received until July 7, 1919.

Street Improvement

WAVERLY, N. Y.

Bids will be received by the City of Waverly, New York, until 7:00 P. M., July 7, 1919, for street improvement consisting of about 1,200 yards excavation, 1,800 yards of compressed gravel pavement, 2,200 yards of reinforced concrete pavement, 1,400 feet of curb and gutter and 1,450 feet of concrete curb.

Address inquiries to PHILIP KERRIGAN, Village Clerk, Waverly, N. Y.

Bids received until July 28, 1919.

Sewer Construction

ABERDEEN, S. DAK.

Notice is hereby given that sealed bids will be received by the Auditor of the City of Aberdeen, South Dakota, until 9:00 o'clock A. M., on Monday, July 28, 1919, for the furnishing of material and labor and constructing a storm sewer for the City of Aberdeen, South Dakota, at which meeting of the Board of Commissioners of said city all proposals will be opened.

All material and work must be in accordance with the plans and specifications on file at the office of the City Engineer and City Auditor.

The work to consist of approximately eight (8) miles of vitrified, segmental block or concrete pipe, running in diameter from 10 inches to 96 inches, with 100 manholes and 212 catchbasins.

Any prospective bidder desiring a set of the plans for personal use may obtain same from the City Engineer by making a deposit of ten dollars ($10) to cover the cost of the blueprints. Refund of one-half the amount deposited will be made on the return of the plans and specifications to the City Engineer within five days following date of receiving bids.

Each bid must be accompanied by a certified check, payable to the City of Aberdeen, in the amount of one thousand dollars ($1,000). Said check will be returned to unsuccessful bidders upon award of contract and to successful bidder when his bond has been approved for the faithful performance of the work.

The city reserves the right to reject any or all bids.

By order of the Board of Commissioners of the City of Aberdeen.

F. W. RAYMOND,
City Auditor.

EQUIPMENT BARGAINS

Consulting Engineer

offers his services for the selection of special motor truck equipment for municipal and engineering uses. For appointment, write CAPT. WHITTEMORE, 219 West 81st St., New York City.

Bulletin No. 250—8n pages is a
SURE MONEY SAVER
Get it—before buying
Contractors' Equipment, Cars, Rails, Mixers, Engines, Piling, Pipe, Bridges, Tanks.
ZELNICKER IN ST. LOUIS

BRIDGES

Fla., Jacksonville—Duval Co. Comrs. will open bids July 22 for sale of $250,000 bridge bonds.

Fla., St. Lucie Co. (P. O. Fort Pierce)—Has voted $35,000 bridge bonds.

Ga., Savannah—Construction of bridge over Savannah River, the location of which would be determined by U. S. engineers is proposed at Savannah. The bridge to be built at Sisters Bluff has been delayed unavoidably. Surveys already made and three engineers are now preparing bids.

Ida., Twin Falls—See "Streets and Roads."

Ill., Ottawa—Seven bridges; Marion Twp.; private plans. Owner ,LaSalle Co. Geo. Farnsworth, Co. Supt. of Highways of LaSalle Co. Reinforced concrete; taking bids.

Ia., Dakotah—Plans being prepared for concrete arch bridge in Humboldt Co.; estimate, $25,000. Address J. C. Devine, Co. Aud.

Ia., Des Moines—City will conduct viaduct over street car tracks at University Ave. and Maine St. this year. Frank Jefferies, City Clk.

Ia., Red Oak—It is planned to expend $25,000 for concrete bridges and culverts in Montgomery Co. Address Co. Engr.

Minn., Duluth—Bonds to amount of $510,000 for county bridge sold to Minneapolis Trust Co., 115 5th St., S., Minneapolis.

N. Y., Elmira—Final plans and specifications for concrete bridge over Chemung River at Main St. accepted by Bd. of Pub. Wks.

N. Y., Watertown—City will soon hold election on bond issue of $60,000 for construction of bridge in Factory Sq.

N. Y., Watertown—Plans have been prepared for bridge at Court St. and bids will soon be asked.

N. Y., Watertown—City will soon advertize for bids on construction of new double-decked Court St. bridge.

N. C., Raleigh—By act of State Hwy. Comn. the Raleigh-Sanford-Albemarle-Charlotte Hwy. gets a bridge over the Yadkin and passageway will cost $80,000.

Wash., Spokane—See "Streets and Roads."

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

***Ark., Little Rock**—J. H. Scruggs, president of Scruggs Construction Co., of Birmingham, Ala., states that his company has been awarded contract by State of Arkansas for construction of $300,000 worth of reinforced concrete bridges, to be built in Monroe, Lonoke and Prairie counties. This contract covers all bridges needed on the Rock and Memphis highway, which forms part of Bankhead highway through Arkansas.

***Mo., Forsythe**—Pioneer Construction Co., Kansas City, Mo., awarded contract for bridge over White River at $20,000.

***O., Akron**—Comrs. awarded Hovey & Humphrey contract for the Ash St. bridge at bid of $13,800. It will be reinforced concrete. Contract for the bridge across Cuyahoga River at Peninsula awarded Concrete Constr. Co., of Canton, at $7,100. It will be of steel.

MISCELLANEOUS

Cal., Colusa—City Trustees decided to call election on matter of municipal bond issue of $20,000 for construction of public swimming pool and baths.

Cal., Los Angeles—City is arranging special election for purpose of voting $4,500,000 bond issue, proceeds to be used for development of harbor cities, Wilmington and San Pedro, which are combined with Los Angeles.

Ind., Laporte—City council making investigations relative to installing an incinerator.

Mich., Pontiac—Five bond issues totaling $486,000 for purchase of five park sites, extension of water mains and other improvements carried at special election. Eight issues submitted, and all carried. Among the number was one to authorize sale of water outside city limits to take care of factory extensions.

N. Y., Watertown—Northern N. Y. Utilities, Inc., will soon let contract for construction of canal near village of Black River. Contract calls for expenditure of $600,000.

O., Sandusky—City will vote Aug. 12 on $500,000 bond issue for harbor improvements.

TOO LATE FOR CLASSIFICATION

BIDS ASKED FOR

STREETS AND ROADS.

Ind., Indianapolis. **10 a.m., July 18.**
34,942 ft. reinforced concrete roads in Marion Co.—L. K. Fesler, Co. Aud.

Ia., Davenport. **2 p.m., July 1.**
Improving streets and alleys, involving 1,093 sq. yd. 6-in. concrete paving, 1,670 sq. yd. 7-in. concrete paving, grading, curbing, etc.—H. W. Phillips, Chmn., Bd. Pub. Wks.

Ia., Dubuque. **8 p.m., July 8.**
Improving alley, involving 570 sq. yd. brick block paving on concrete foundation, asphalt or pitch filler to be used; also improving road, involving 2,554 sq. yd. bitulithic or tarvia paving on old macadam base, outside car tracks, 328 sq. yd. brick block on concrete foundation inside car tracks, 1,496 sq. ft. cement gutter, curbing, etc.—J. Stuber, City Recorder.

N. J., Trenton. **10.30 a.m., July 14.**
Repairing 14,000 ft. road in Woodbridge Twp. with bituminous dressing.—A. L. Grover, Chief Clk., State Hwy. Comn.

O., Blanchester. **July 1.**
Brick paving.—W. L. Hixon, Vil. Clk.

O., Kenton. **July 7.**
Road in Goshen Twp.—C. Harmon, Twp. Clk.

O., Navarre. **July 2.**
Grading and paving with brick 1.15 mi. village streets.—W. C. Shick, Clk., Bd. Comrs., Canton.

Tex., Fairfield. **2.30 p.m., July 8.**
Grading, macadamizing and constructing reinforced concrete bridges and culverts on 10.3 mi. state highway, involving 1.7 acres clearing and grubbing, 63,120 cu. yd. earth excavation, 10.3 mi. macadam or gravel surfacing, etc.—Bryant & Huffman, Co. Engrs., Austin.

Va., Roanoke. **noon, July 18.**
Granolithic sidewalks, curb and gutter, concrete paving and 8-in. sewer.—City Engr.

SEWERAGE.

Mass., Chicopee. **noon, July 5.**
Section of 60-in. truck sewer, concrete outfall, and submerged outlet.—F. P. Cobb, City Engr.

WATER SUPPLY.

O., Youngstown. **July 2.**
500 tons cast iron pipe and fittings.—C. F. Ohl, Clk., Bd. Pub. Serv.

O., Canton. **July 12.**
Water fittings for new reservoir in Union Dam field.—Pub. Serv. Dir.

R. I., Providence. **2.15 p.m., July 7.**
91 tons cast iron water pipe.—Comr. Pub. Wks.

Tex., Corsicana. **4 p.m., July 1.**
Laying 3 mi. 14-in. cast iron water main.—J. A. Harper, City Secy.

LIGHTING AND POWER.

Greece. **Sept. 11.**
Installation and operation under contract for a period of years of an electrical plant to furnish light and power to city in Greece and its surroundings.—Bur. of Foreign and Domestic Commerce, Washington, D. C. (Refer to Opportunity No. 29759.)

BRIDGES.

Mich., Mt. Clemens. **1.30 p.m., July 3.**
State trunk line bridge across Clinton River, consisting of two 70-ft. and one 75-ft. reinforced concrete arches, requiring 3,660 cu. yd. reinforced concrete.—F. F. Rogers, State Hwy. Cor., Lansing.

O., Canton. **9 a.m., July 14.**
Culvert on Cleveland-Massillon Rd.—W. C. Shick, Clk., Bd. Co. Comrs.

MISCELLANEOUS.

N. J., Somers Point. **8 p.m., July 7.**
Reconstructing municipal pier.—J. E. Scull, City Clk.

STREETS AND ROADS.

In., Waterloo — Co. Bd. designated order in which the 76 mi. of primary road system in Black Hawk shall be paved. Work will probably be started on Project No. 1 in 1920. The procedure will be in the following order: No. 1—From Buchanan county line to east limits of Waterloo, and from west limits of Cedar Falls to Grundy county line, the Hawkeye Hwy. No. 2—From the west limits of Waterloo, southwest to Hudson, thence to Tama county line, and west to Grundy county line; also from southeast limits of Waterloo to La Porte City, and south to Benton county line, on Red Ball route. No. 3—From north limits of Waterloo, north and west to Cedar Falls; from the north limits of Cedar Falls to Bremer county line; also from south limits of Cedar Falls to Grundy county line. A petition was presented asking an improvement district be authorized for graveling road from southern line of Hudson, each five mi. to Eagle Center Rd.

Mich., Lansing—City Council to consider a $204,000 paving bond issue. The paving bond resolution provides for paving Hill St., East Saginaw St., West Saginaw St., Allegany st., Moores River Dr. and Sparrow Ave., Grandt Ave., Main St., Holmes St., St. Joseph St., Sycamore St.

Minn., Duluth—Special election, July 1, in St. Louis Co. to vote on bond issue of $7,500,000 for permanently improving state roads.

Minn., Duluth—City Council adopted resolution to appropriate $67,536 for improvement of Fifty-nine Ave.; also $34,950 to be spent on several other streets.

Minn., St. Paul—A communication from North Central Commercial Club called attention to condition of Rice St. from Northern Pacific Bridge to city limits, St. Peter St., Rondo St. and Como Ave., suggesting improvements. It was referred to Comr. Goss, who announced a willingness to pave all streets.

Mo., Kansas City—Several important improvements launched by Park Bd. Plans were ordered prepared for extension of Linwood Blvd. The Bd. also ordered resolutions prepared for extension of Pershing Rd. This will require a 149-ft. strip, one-half of which will carry road to the level of the Penn St. viaduct and the other half will provide roadway to subway level under the viaduct. The subway road will connect with the 25th St. project, providing for widening of 25th St. to Southwest Blvd. The Bd. also discussed plan to widen Admiral Blvd. by setting back the curb lines.

Mo., St. Joseph—Following is summary of Council proceedings: Ordinances were passed for paving with concrete Albemarle St., for paving with brick blocks 4th St., for paving with asphaltic concrete 17th St., for paving with asphaltic concrete Lowell St., for grading alley between Francis and Felix, 26th to 27th; for grading Scott St., 12th to 14th; for grading 14th St., vacating alley in Block 1, Wilson Pl., South Park; repealing ordinances for concrete sidewalks on Gordon Ave., Ohio to Michigan.

N. Y., Watertown—City Council will discuss resolution to build concrete pavement in Walden Ave. and Hewitt St.; also in Pearl St. Width to be 32 ft.

Pa., Scranton — Mayor Connell has signed contracts with Gaynor Construction Co. for paving Pine St. and Taylor Ave. Work will begin at once under provisions of the contract must be completed within 60 days.

Pa., Upper Yoder—Bd. of Supervisors will receive sealed bids July 14 on $175,000 bond issue for Millcreek Rd. reconstruction.

Tex., Austin — Atty.-Genl. approved $25,000 road bonds for Kaufman Co. and $40,000 Eastland City waterworks bonds.

Utah, Salt Lake City—At present authorities are considering constructing a nine-ft. concrete road between St. George and Cedar City, for a distance of 56 mi. Co-operative agreement with the Govt. was signed for construction of Wolf Creek section of Kamas-Stockmore Rd., 12 mi. in length, at cost of $20,000, of which the State will pay half. Provo has appealed to Comn. to construct an 18-ft. paving strip of concrete from north city limits to Center St. in that city; and on Third South St. east 3,441 ft. and then south to city limits, 8,230 ft. This the Comn. has agreed to do. Details will be worked out by Ira R. Browning, State Rd. Comr. and City Council.

Va., Lynchburg—Town of Houston voted bond issue of $18,000 to connect up with road at corporate limits and pave main street of town. South Boston Council decided to hold election on question of issuing $85,000 bonds for purpose of paving upper Main St., from High School to corporate limits where concrete highway enters city. Main St. is already paved with bitulithic pavement to the High School.

Wash., Anacortes—An ordinance providing for paving of 7th and 8th Sts., from Commercial to K Ave., and 9th St., from Commercial to E Ave., has been passed and bids will be called for shortly. Either bitulithic or concrete will be used. Cost, approximately $37,000.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

***Mo., St. Louis**—Contract was awarded Woermann Construction Co. in amount of $28,984.02 for construction of reinforced concrete bridge on Southwest Ave. over tracks of the Oak Hill branch of the Missouri Pacific Railroad.

N. Y., New Rochelle—Many streets to be improved by Bd. of Pub. Wks. The Bd. provided $1,400 for resurfacing 8th St. with penetration macadam and $3,300 for resurfacing Union Ave., from 6th to 8th Sts. All bids of contractors for three-ft. curb and gutter in Hilltop Ave. and St. Paul's Pl. were over appropriation of $3,805; the sum of $445 additional was provided that contract might be awarded, and the work proceed without further delay. For resurfacing Quaker Ridge Rd. the issuance of $18,950 construction certificates was authorized. The laying of new penetration macadam on Winyah Ave. sum of $14,560 to be provided.

***N. Y., Oswego**—Pathfinder Construction Co., of Fulton, has been awarded contract for construction of Baldwinsville-Plainville Rd., 7½ mi. long. Their bid was $225,984.25 against engineer's estimate of $243,345.55. The Corbett Co., of Pittsburgh, next low bid, $240,002.65.

Pa., Harrisburg—State Highway Commissioner Lewis S. Sadler awarded contracts for road construction aggregating 333,804 ft., on bids received June 17. In each instance the award went to low bidder. Following are the awards:

Blair Co., Logan Twp., Route 221, 23,075 ft. of repair work: Eastern Paving Co., Philadelphia, $27,200.

Blair Co., Gaysport Boro., Route 53, 890 ft. of reinforced concrete: Standard Contracting Co., Altoona, Pa., $5,372.70.

Bradford Co., Athens Twp., Route 287, Section 3, 6,640 ft. of plain concrete: Valley Construction Co., Athens, Pa., $38,540.60.

Cambria Co., Jackson Twp., Route 314, Section 1, 22,185 ft. of reinforced concrete and Hillside vitrified brick: The Nicola Building Co., Pittsburgh, Pa., $259,953.50.

Centre Co., Boggs Twp., Routes 107 and 219, Section 1, 27,940 ft. of construction: Vipond Construction Co., Altoona, Pa., $215,730.50.

Chester Co. Oxford Boro., Route 131, 2,958 ft. of construction: Juniata Co., Philadelphia, Pa., $21,601.50.

Crawford Co., Woodcock and Rayfield Twps., Route 84, 9,067 ft. of reinforced concrete: Keystone Construction Co., Meadville, Pa., $62,626.50.

Cumberland Co., Upper Allen Twp., Route 123, Section 1, 24,275 ft. of reinforced concrete and Hillside vitrified brick: Langthorne Co., Inc., New York City, $161,604.95.

Erie Co., Girard Boro., and Girard Twp., Route 86, 4,954 ft. of bituminous surface course on concrete foundation and vitrified brick: Mayer Bros. Construction Co., Erie, $56,633.95.

Make the Installation Permanent

When you put in GLAUBER BRASS you can **"forget it"** for at least **FIVE YEARS**—the GLAUBER GUARANTEE protects you against tearing up pavements, expensive replacements, etc.

All GLAUBER BRASS possesses ample reserve strength—tested by the 200-pound hydraulic test that proves GLAUBER QUALITY the best and cheapest. It is used by the majority of water works in the United States.

GLAUBER BRASS MFG. CO., Cleveland, Ohio

NEW YORK ST. LOUIS SAN FRANCISCO CHICAGO

800,000,000 Million Gallons
OF
PURE WATER
Daily Furnished by
PITTSBURGH FILTERS

FILTRATION PLANT, WACO, TEX.
Over 200 Cities Supplied
We also manufacture
VENTURA METERS, Dry Feed Chemical Machines, Liquid Chlorine Apparatus, Controller Gauges, etc.
ALSO
HEAVY DUTY OIL ENGINES
Pittsburgh Filter & Engineering Co.
PITTSBURGH, PA. KANSAS CITY, MO.
General Sales Office Engine Dept.
280 Broadway, New York, N. Y.

Lambert Meters

Manufactured by
THOMSON METER CO.
100-110 BRIDGE ST., BROOKLYN, N. Y.

MICHIGAN PRODUCTS

Fire Hydrants	Shear Valves
Gate Valves	Tide Valves
Sluice Gates	Sleeve Valves
Check Valves	Indicator Posts
Foot Valves	Valve Boxes

Flower Valve Manufacturing Co.
105 Parkinson St., Detroit, Mich.

DIRECTORY OF CONSULTING ENGINEERS

Engaged in Municipal and Public Works

ALVORD, JOHN W.
BURDICK, CHAS. B.
Consulting Engineers

Reports, Investigations, Plans and Specifications for Water Supplies, Water Purification, Water Power, Sewerage, Sewage Disposal.

Hartford Building, Chicago

THE AMERICAN APPRAISAL CO.

Milwaukee New York

Authoritative Reports and Valuations Covering Public Utility, Municipal Mineral, Industrial, Commercial and Residence Properties.

BLACK & VEATCH
Consulting Engineers

Inter-State Bldg., Kansas City, Mo.

Sewerage, Sewage Disposal, Water Supply, Water Purification, Electric Lighting, Power Plants, Valuations, Special Investigations, Reports.

E. B. Black N. T. Veatch, Jr.

BROSSMAN, CHAS.
Consulting Engineer

Merchants' Bank Building, Indianapolis, Ind.
Water Supply, Sewerage and Disposal. Lighting Plants—Supervision of Construction and Operation. Appraisals—Expert Testimony.

BURNS & McDONNELL
Consulting Engineers

Appraisals — Rate Investigations
Expert Testimony — Water Works
Sewerage — Lighting

Clinton S. Burns — R. R. McDonnell
Kansas City — Inter-State Bldg.

CAIRD, JAMES M.
Assoc. Am. Soc. C. E.
Chemist and Bacteriologist

Office and Laboratory:
271 River Street, Troy, N. Y.

Water Analysis and Tests of Filter Plants

COLLINS, JOHN L.
Consulting Civil and Sanitary Engineer

WATER SUPPLY and PURIFICATION
SEWERAGE and SEWAGE DISPOSAL
Plans, Estimates and
Supervision of Construction

30 Church Street, New York City

DOW & SMITH
Chemical Engineers

Consulting Paving Engineers

A. W. Dow, Ph.B. — F. P. Smith, Ph.B.
Mem. Am. Inst. Ch. Engrs.
Mem. Am. Soc. Civ. Engrs.

Asphalt, Bitumens, Paving, Hydraulic Cement, Engineering Materials.

131-3 East 23d Street, New York

New York City — 2 Rector Street

A. E. HANSEN
Hydraulic and Sanitary Engineer
Design and Supervision of Construction

Sewerage	Water Works
Sewage Disposal	Water Purification
Drainage	Water Works Valuation
Garbage Disposal	Water Analyses

HAZEN, WHIPPLE & FULLER
Consulting Hydraulic and Sanitary Engineers, Water Supply, Sewerage, Drainage, Valuations, Supervision of Construction and Operation.

ALLEN HAZEN — G. C. WHIPPLE
W. R. FULLER — F. F. LONGLEY
C. M. EVERETT — L. N. BABBITT
H. MALCOLM PIRNIE

30 East 42d Street, New York City

HERING, RUDOLPH, D.Sc
Consulting Engineer

Water Supply, Sewage and Refuse Disposal
170 Broadway, New York City

Telephone—Cortlandt 6309

NICHOLAS S. HILL, JR. — S. F. FERGUSON

HILL AND FERGUSON
Consulting Engineers

Water Supply — Sewage Disposal
Hydraulic Developments

Reports, Investigations, Valuations, Rates, Design, Construction, Operation, Management. Chemical and Biological Laboratories.

100 William Street — New York City

Experts Are Building Our Cities

All over the country, in metropolis and village, are splendid monuments to the skill and experience of consulting engineers.

They have set high standards of far-sighted planning, good design, economical operation and public benefit. Upon their scientific investigations have been based sound public policies of improvement, sanitation, administration and public utility relations.

The wisest cities appreciate that they can profit by the counsel of these authorities. Good advice costs less than mistakes. Experts cost less than lawsuits, official failure or public disapproval.

The experts listed on this page are recognized leaders in their specialties. They have years of demonstrated experience and skill to place at the disposal of any city which would build wisely.

JAMES P. WELLS
CONSULTING ENGINEER

Investigations, Surveys, Plans and Supervision of Construction of

Municipal
Water Supply Systems

Specialist in locating new sources of Public Water Supplies.

Cutler Building, Rochester, N.Y.

HOWARD, J. W.
Consulting Engineer
Pavements and Roads

LABORATORY ANALYSES AND TESTS OF ALL MATERIALS
CONSTRUCTION INSPECTED
30 YEARS' EXPERIENCE

1 Broadway, New York City

MORRIS KNOWLES, Inc.
ENGINEERS

MORRIS KNOWLES — JOHN M. RICE
MAURICE R. SCHARFF — GEORGE F. MAGLOTT
NATHAN B. JACOBS

Town Planning and Municipal Engineering. Industrial Housing. Water Supply. Sewerage and Sewage Disposal. Flood Control. Hydro-Electric Developments. Investigations and Reports. Valuations and Appraisals. Rate Cases. Plans and Specifications. Supervision of Construction. PITTSBURGH, PA., WINDSOR, ONT.

POLLOCK & TABER
Consulting Engineers

Pavements, Highways, Water Supply, Drainage, Sewerage and Sewage Disposal. Designs, Specifications and Supervision.

Clarence D. Pollock } Members
George A. Taber } Am. Soc. C. E.

Park Row Bldg., New York City

POTTER, ALEXANDER
50 Church Street, New York City
Civil and Sanitary Engineer

Specialties:
Water Supply, Sewerage and Pavements

ROBINSON, GEO. L.
37-39 East 28th St., New York City

Civil and Sanitary Engineer

Specialties:
Water Supply, Sewers and Sewage Disposal

STILLMAN & VAN SICLEN
Chem. Lab. Co., Inc.

CHEMISTS AND CHEMICAL ENGINEERS

Asphalt — Road Materials
Water — Coal

General Chemical Analyses and Reports

227 Front Street — New York City

TAYLOR, HENRY W.
154 Nassau Street, New York City
100 State Street, Albany, N. Y.
Consulting Engineer

Water, Sewerage, Trade Wastes, Pumping Plants

Roads, Pavements, Sewerage and Sewage Disposal, Town Planning

CHAS. R. WARD Engineering Corporation

32 Court Street, Brooklyn, New York

Consulting, Designing and Constructing Engineers

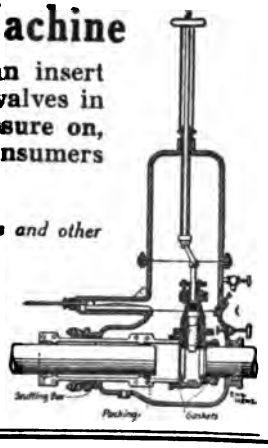
Surveys, Reports, Plans, Specifications Inspection and Supervision

Valve Inserting Machine

With this machine you can insert new and cut out defective valves in water mains with full pressure on, avoiding annoyance to consumers and increased fire risks.

Write for complete description of this and other water works specialties.

See Sweet's Catalogue, Engineering Edition, for Details and Particulars.



THE A. P. SMITH MFG. CO.
EAST ORANGE, N. J.

Manufacturers of
CAST IRON PIPE
BELL AND SPIGOT
FOR WATER—GAS—CULVERTS—SEWERS
Also Flexible Joint Pipe—Cylinders—Tubes, Milled and Plain Ends—High Pressure Fire Service Pipe—Special Castings. Flanged Castings a Specialty.
Quality and Service Guaranteed
FLANGED PIPE
Warren Foundry & Machine Company
Offices, 11 Broadway, N. Y. 201 Devonshire St., Boston, Mass.
Works, Phillipsburg, N. J.

MODERN SEWAGE TREATMENT

Sanitation R-W Process

Fine screening before sprinkling filters overcomes clogging of nozzles and increases filter bed efficiency.

THE SANITATION CORPORATION
Apparatus, Equipment and Complete Plants for Sewage Disposal
50 CHURCH STREET NEW YORK

Roberts Filter Mfg. Co.
Darby, Penna.
WATER FILTERS for Municipal and Industrial Plants. Gravity and Pressure Types.
CHEMICAL DEVICES

FILTERS
Hypochlorite Apparatus and Water Softening Plants
The New York Continental Jewell Filtration Company
General Offices and Works: NUTLEY, N. J.
111 W. Monroe Street, CHICAGO New Birks Building, MONTREAL

DECARIE INCINERATORS
FOR MUNICIPALITIES AND INSTITUTIONS
—ECONOMICAL AND SANITARY—
STACY-BATES COMPANY
MERKNIGHT BLDG SELLING AGENTS WRITE FOR LITERATURE MINNEAPOLIS

COTTON RUBBER LINED
Wax and Para Gum Treated **FIRE HOSE**
MILDEW AND ROTPROOF
FABRIC FIRE HOSE MANUFACTURING CO
Cor. Duane and Church Streets NEW YORK

DIRECT OXIDATION PROCESS
FOR
WATER and SEWAGE TREATMENT

Direct Oxidation Process Corp., Licensee
15th Street and Lehigh Avenue Philadelphia, Pa.

BUYERS' CLASSIFIED DIRECTORY

of Names and Addresses of Firms from Whom to Buy Materials, Appliances and Machinery Needed by Municipal Departments and Contractors

Building Stone

•Badger Crushed Granite Co., 133 W. Washington St., Chicago, Ill.

Cement

•Alpha Portland Cement Co., Easton, Pa.

Contractors' Equipment

(See Paving Machinery also.)

CRANES AND HOISTS.

•The Brown Hoisting Machinery Co., Cleveland, Ohio.

CLAM SHELL BUCKETS.

•Geo. Haiss Mfg. Co., 146th St. and Rider Ave., N. Y. City.

CRUSHERS.

•Universal Road Machinery Co., Kingston, N. Y.

DUMP WAGONS.

•Austin Western Road Machinery Co.

DUMPING BUCKETS.

Stuebner, G. E., Iron Works, Hancock St., Long Island City.

DUMPING CARS AND CARTS.

•Koppel Industrial Car & Equipment Co., Koppel, Beaver County, Pa.
•Lee Loader & Body Co., 2843 S. La Salle St., Chicago, Ill.
•Walter A. Zelnicker Supply Co. in St. Louis, U. S. A.

ENGINES.

•Walter A. Zelnicker Supply Co. in St. Louis, U. S. A.

MOTOR TRUCKS, DUMPING.

•Four Wheel Drive Auto Co.

GYRATORY ROCK CRUSHERS.

•Austin Western Road Machinery Co.

PUMPS, DIAPHRAGM.

•Parker, A. A., Waterford, N. Y.

RAILS.

•Walter A. Zelnicker Supply Co. in St. Louis, U. S. A.

DANGER SIGNALS.

•The Automatic Signal & Sign Co., Canton, O.
•Ingran-Richardson Mfg. Co., Beaver Falls, Pa.

WAGON LOADERS.

•Geo. Haiss Mfg. Co., 146th St. and Rider Ave., N. Y. City.

Fire Dept. Equipment

COMBINATION CHEMICAL AND HOSE WAGONS.

•American-La France F. E. Co., Elmira, N. Y.

FIRE ALARMS SYSTEMS.

•Leper Fire Alarm Co., Stonington, Conn.

FIRE HOSE.

Fabric Fire Hose Co., Duane & Church Sts., New York.

PUMPING ENGINES, GASOLENE.

•American-La France F. E. Co., Elmira, N. Y.

RUBBER TIRES.

•United States Rubber Co., 1790 Broadway, N. Y.

TRACTORS.

•Coupler Gear Freight-Wheel Co., 495 Buchanan Ave., Grand Rapids, Mich.

TRIPLE COMBINATION MOTOR.

•American-La France F. E. Co., Elmira, N. Y.

Paving and Road Machinery

ASPHALT PLANTS.

•Cummer & Son Co., Cleveland, O.
•East Iron & Machine Co., Lima, O.
•Hetherington & Berner, Indianapolis, Ind.
•Warren Bros. Co., Boston, Mass.

CAR UNLOADERS.

•Universal Road Machinery Co., Kingston, N. Y.

CONCRETE MIXERS.

•Koehring Machine Co., Milwaukee, Wis.
•Northwestern Steel & Iron Works, Eau Claire, Wis.
•W. A. Zelnicker Supply Co. in St. Louis, U. S. A.

OIL DISTRIBUTORS.

•Austin Western Road Mach. Co., Chicago, Ill.
•The Kinney Mfg. Co., 3529 Washington St., Boston, Mass.

OIL SPRAYERS.

•Universal Road Machinery Co., Kingston, N. Y.

ROAD GRADERS.

•Austin-Western Road Mach. Co., Chicago, Ill.
•Koehring Machine Co., Milwaukee, Wis.
•F. B. Zieg Mfg. Co., Fredericktown, O.

ROAD PLANERS.

•Austin Western Road Machinery Co.

ROAD ROLLERS.

•Austin-Western Road Mach. Co., Chicago, Ill.

MOTOR TANDAM ROLLERS.

•Austin Western Road Machinery Co.

SCARIFIERS.

•Austin Western Road Machinery Co.
•Universal Road Machinery Co., Kingston, N. Y.

SCRAPERS.

•Austin-Western Road Mach. Co., Chicago, Ill.

SCREENS.

•Universal Road Machinery Co., Kingston, N. Y.

TAR KETTLES, ASPHALT HEATERS, ETC.

•Connery & Co., 3900 N. Second St., Philadelphia, Pa.
•Littleford Bros., Cincinnati, O.
•Warren Bros. Co., 142 Berkeley St., Boston.

WAGON LOADERS.

•Geo. Haiss Mfg. Co., 146th St. and Rider Ave., N. Y. City.

Paving Materials

ASPHALT.

•Barber Asphalt Paving Co.
•Bitoslag Paving Co., 90 West St., N. Y.
•Kentucky Rock Asphalt Co., Louisville, Ky.
•Standard Oil Co., 26 Bway., N. Y.
•Standard Oil Co. of N. J., 26 Broadway, N. Y.
•U. S. Asphalt Refining Co., 90 West St., N. Y.

BINDERS.

•Barber Asphalt Paving Co.
•Barrett Co., The, 17 Battery Pl., N. Y.
•Marden, Orth & Hasting Corp., 136 Liberty Street, New York City.
•Standard Oil Co., 26 Broadway, N. Y.
•U. S. Asphalt Refining Co., 90 West St., N. Y.

BITUMINOUS PAVEMENTS.

•Barber Asphalt Paving Co.
•Barrett Co., The, 17 Battery Pl., N. Y.
•Warren Bros. Co., 142 Berkeley St., Boston.
•Willite Road Construction Co., Inc., 51 Chambers St., New York City.

BRICK.

•Terre Haute Vitrified Brick Co., Terre Haute, Ind.
•Thornton Fire Brick Co., 909 Gaff Bldg., Clarksburg, W. Va.

EXPANSION JOINTS.

•Barrett Co., The, 17 Battery Pl., N. Y.
•Trusson Steel Co., Youngstown, O.
•Chicago Incinerator Co., Monadnock Block, Chicago, Ill.

OIL.

•Barrett Co., The, 17 Battery Pl., N. Y.
•Indian Refining Co., 244 Madison Ave., N. Y.
•Standard Oil Co., 26 Broadway, N. Y.
•Standard Oil Co., 72 West Adams St., Chicago, Ill.
•U. S. Asphalt Refining Co., 90 West St., N. Y.

PAVING BLOCK.

•Badger Crushed Granite Co., 133 W. Washington St., Chicago, Ill.

WOOD PAVING BLOCKS.

•Wyckoff Pipe and Creosoting Co., 30 E. 42d St., N. Y.

Reinforcing.

•Clinton Wire Cloth Co., Boston, Mass.

Scientific Instruments

ENGINEERS' TRANSITS AND LEVELS.

Heller & Brightly, 1124 Spring Garden, Philadelphia, Pa.

BLUEPRINT MACHINES.

•Wickes Bros., Dept. B, Saginaw, Mich.

Sewerage

CULVERT FORMS.

•Northwestern Steel & Iron Works, Eau Claire, Wis.

PIPE (CAST IRON).

•Warren Foundry & Machine Co., 11 Broadway, N. Y.
•Walter A. Zelnicker Supply Co. in St. Louis, U. S. A.

PIPE CLEANING MACHINES.

•Champion Potato Machine Co., Hammond, Ind.
•W. H. Stewart, 131 George St., Boston, Mass.

PIPE JOINT COMPOUND.

•Pacific Flush Tank Co., Chicago and New York.
•Standard Paint Co., New York City.

EJECTORS.

•Pacific Flush Tank Co., Chicago and New York.

NOZZLES.

•Pacific Flush Tank Co., Chicago and New York.

SEWAGE DISINFECTION.

•Electro Bleaching Gas Co., 19 East 41st St., N. Y.

RODS.

•The F. Bissell Co., Toledo, O.
•W. H. Stewart, 131 George St., Boston, Mass.

SIPHONS AND FLUSH TANKS.

•Pacific Flush Tank Co., Chicago and New York.

VITRIFIED FIRE CLAY SEWER TILE.

East Ohio Sewer Pipe Co., Irondale, O.

Street Cleaning

And Refuse Disposal

CARTS.

•Geo. H. Holsbog & Bro., Jeffersonville, Ind.

MANHOLES—CATCH BASINS.

•Wm. E. Dee Co., 30 N. La Salle St., Chicago, Ill.
•Odorless Sewer Basin Co., Youngstown, O.

INCINERATORS.

•Chicago Incinerator Co., Monadnock Block, Chicago, Ill.
•Stacy-Bates Co., McKnight Bldg., Minneapolis, Minn.

SPRINKLING WAGONS AND FLUSHERS.

•Austin Western Road Mach. Co., Chicago, Ill
•Tiffin Wagon Co., Tiffin, Ohio.

STREET SWEEPERS.

•Austin Western Road Mach. Co., Chicago, Ill
•Elgin Sales Company, New York and Chicago
•Universal Road Machinery Co., Kingston, N. Y.

Street Signs

•A. G. A. Railway Light & Signal Co., Elizabeth, N. J.
•The Automatic Signal & Sign Co., Canton, O

VEHICLE DIRECTOR.

•J. H. Lehman, Elkhart, Ind.

Advertisers--See Alphabetical Index on last white page.

BUYERS' CLASSIFIED DIRECTORY

Water Works

AIR COMPRESSORS.
*Machinery Warehouse & Sales Co., Old Colony Bldg., Chicago, Ill.
*Sullivan Mchy. Co., 122 S. Michigan Ave., Chicago, Ill.

AIR LIFT PUMPS.
*Sullivan Mchy. Co., 122 S. Michigan Ave., Chicago, Ill.

CHLORINE, LIQUID.
*Electro Bleaching Gas Co., 19 East 41st St., N. Y.
*Ozone Co. of America, Milwaukee, Wis.

CORPORATION AND STOP COCKS.
*Flower Valve Mfg. Co.
*Glauber Brass Mfg. Co., Cleveland, O.

DEEP WELL PUMPS.
*Cook, A. D., Lawrenceburg, Ind.
*Layne & Bowler Co., 1117 Exchange Bldg., Memphis, Tenn.

DISINFECTING CHEMICALS.
*Electro Bleaching Gas Co., 19 East 41st St., N. Y. C.
*Ozone Co. of America, Milwaukee, Wis.

FILTERS.
*N. Y. Continental Jewell Filtration Co., Nutley, N. J.
*Pittsburgh Filter Co., Pittsburgh, Pa.
*Roberts Filter Co., Darby, Pa.

FILTRATION PLANTS.
*Pittsburgh Filter Co., Pittsburgh, Pa.
*Roberts Filter Co., Darby, Pa.

FLAP VALVES.
*Coldwell-Wilcox Co., Newburgh, N. Y.

METERS.
*Hersey Mfg. Co., South Boston, Mass.
*Pittsburgh Meter Co., East Pittsburgh, Pa.
*Thomson Meter Co., 110 Bridge St., Bklyn.
*Union Water Meter Co., 33 Hermon St., Worcester, Mass.

METER BOXES.
*Ford Meter Box Co., Wabash, Ind.
*Pittsburgh Meter Co., East Pittsburgh, Pa.
*H. W. Clark Co., Mattoon, Ill.

METER TESTING MACHINES.
*Ford Meter Box Co., Wabash, Ind.
*Pittsburgh Meter Co., East Pittsburgh, Pa.

PIPE, CAST IRON.
*Central Foundry Co., 90 West St., N. Y.
*Warren Foundry & Machine Co., 11 Broadway, N. Y.
*Walter A. Zelnicker Supply Co., St. Louis, Mo.

PIPE, STEEL.
*East Jersey Pipe Corporation, Fulton and Church Sts., N. Y.

PIPE, WOOD.
*Wyckoff Pipe & Creosoting Co., 30 E. 42d St., N. Y.

PUMPS.
*Cook, A. D., Lawrenceburg, Ind.
*Dayton, Dick, Co., Quincy, Ill.
*Luitwieler Pumping Engine Co., Rochester, N. Y.

SCREENS FOR WELLS.
*Cook, A. D., Lawrenceburg, Ind.
*Layne & Bowler Co., 1117 Exchange Bldg., Memphis, Tenn.

SHEAR VALVES.
*Coldwell-Wilcox Co., Newburgh, N. Y.

SLEEVES AND VALVES.
*Kennedy Valve Mfg. Co., Elmira, N. Y.
*Smith, A. P., Mfg. Co., East Orange, N. J.

SLUICE GATES.
*Coldwell-Wilcox Co., Newburgh, N. Y.

STRAINERS.
*Cook, A. D., Lawrenceburg, Ind.

TANKS.
*Walter A. Zelnicker Supply Co. in St. Louis, U. S. A.

TAPPING MACHINES.
*Smith, A. P., Mfg. Co., East Orange, N. J.

VALVES.
*Flower Valve Mfg. Co., 105 Parkinson St., Detroit, Mich.
*Kennedy Valve Mfg. Co., Elmira, N. Y.

WASTE DETECTION.
*The Pitometer Co., 27 Elm St., N. Y.

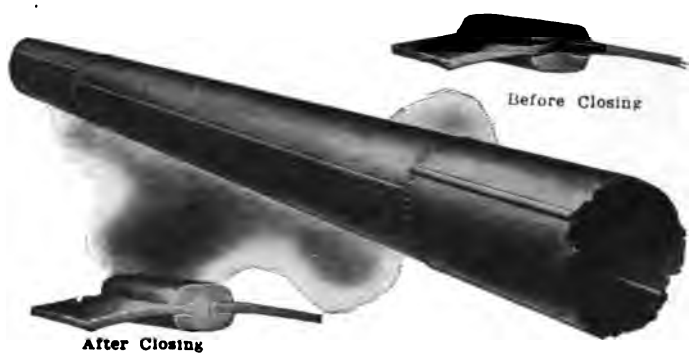
WATER MAIN CLEANING.
*National Water Main Cleaning Co., 50 Church St., N. Y.

WATER PURIFICATION.
*Electro Bleaching Gas Co., 19 East 41st St., N. Y.
*N. Y. Continental Jewell Filtration Co., 15 Broad St., N. Y.
*Ozone Co. of America, Milwaukee, Wis.

WATER STERILIZATION.
*Electro Bleaching Gas Co., 19 East 41st St., N. Y.
*Ozone Co. of America, Milwaukee, Wis.

WATER SUPPLY FROM WELL SYSTEMS.
*Cook, A. D., Lawrenceburg, Ind.

WELL DRILLS.
*Layne & Bowler Co., 1117 Exchange Bldg., Memphis, Tenn.



After Closing

13,000,000 People depend on LOCK BAR STEEL PIPE

And have never once been disappointed.

Cities with an aggregate of 13,000,000 population have pinned their faith to Lock Bar Steel Pipe.

They have capitalized both upon its service and economy features.

No citizen has ever suffered through Lock Bar Steel Pipe—it has never failed in service.

In addition the Lock Bar Joint is 100% efficient—it develops the strength of the full section of the plate.

Why not have us tell you more about the true economy of using Lock Bar Steel Pipe?

EAST JERSEY PIPE CORPORATION

Fulton and Church Sts., New York City Works: Paterson, N. J.

The Test of Service

Hartford, Conn., showing a Group of Insurance Company Buildings

APPLY the test of service to American-LaFrance motor fire apparatus. You will find that for rugged endurance and day-after-day dependability the records of American-LaFrance operation leave no doubt in your mind as to American-LaFrance in-built quality.

¶ Hartford, Connecticut uses American-LaFrance motor fire apparatus extensively and there are now twelve pieces in service.

Nothing Talks Like Actual Performance

AMERICAN LAFRANCE FIRE ENGINE COMPANY, INC.

Elmira, New York

SAFE SANE

The Lehman Vehicle Direction Indicator

is a safe and sane warning device. Its distinctive color and commanding appearance by day and its lamp at night warn the motorist—it's safe. But if an accident does happen, the victim doesn't have to pay with his life or his machine if he goes into the indicator—it's sane.

The Lehman "Traffic Cop" does its work day and night. It is durable—it is built to stand hard shocks. When it is struck it just bows down until the vehicle passes over—then it rights itself automatically.

Write for more information

J. H. LEHMAN, ELKHART INDIANA

Index to Advertisements

A	Page
Alpha Portland Cement Co.	—
Alvord & Burdick	34
American Appraisal Co., The	34
American-La France Fire Eng. Co.	38
American Tel. & Tel. Co.	—
Atlantic Refining Co.	3
Austin-Western Road Mach'y Co.	21
Automatic Signal & Sign Co., The.	—

B	
Badger Crushed Granite Co.	—
Barber Asphalt Paving Co.	—
Barrett Co., The	—
Bissell Company, F.	—
Bitoslag Paving Co.	23
Black & Veatch	34
Broesman, Chas.	34
Brown Hoisting Mach. Co.	—
Burns & McDonnell	34
Buffalo Springfield Roller Co.	—

C	
Caird, James M.	—
Cast Iron Pipe Pub. Bureau, The.	—
Champion Potato M'chy Co.	—
Chicago Incinerator Co.	39
Clark, H. W. Co.	39
Clinton Wire Cloth Co.	—
Coldwell-Wilcox Co	27
Collins, J. L.	34
Cook, A. D.	—
Connery & Co.	21
Cummer, F. D., & Son Co.	23

D	
Dayton Dowd Co.	—
Dee, Wm. E., Co.	39
Diamond Labor Agency	2
Direct Oxidation Process Corp.	35
Dow & Smith	34
Duff Mfg. Co.	—

E	
East Iron & Mach. Co., The.	23
East Jersey Pipe Corporation	37
East Ohio Sewer Pipe Co.	36
Electro Bleaching Gas Co.	29
Elgin Sales Corp.	—

F	
Fabric Fire Hose Mfg. Co.	35
Flower Valve Mfg. Co.	33
Ford Meter Box Co.	29
Four Wheel Drive Auto Co.	—

G	
Glauber Brass Mfg. Co.	33

H	
Haiss Mfg. Co.	2
Hansen A. E.	34
Hazen, Whipple & Fuller	34
Heller & Brightly	36
Hetherington & Berner	2 & 19
Hering, Rudolph	34
Hersey Mfg. Co.	27
Hill & Ferguson	34
Holsbog & Bro., Geo. H	—
Hornblower & Weeks	—
Howard, J. W.	34

I	
Indian Refining Co.	2
Ingram Richardson Mfg Co.	1

K	Page
Kelley, Springfield Motor Truck Co.	—
Kennedy Valve Co.	—
Kentucky Rock Asphalt Co	3
Kinney Mfg Co.	17
Knowles, Morris	34
Koehring Machine Co.	6
Koppel Industrial Car & Equipment Co.	23

L	
Layne & Bowler Co.	27
Lee Loader & Body Co.	—
Lehman, J. H.	38
Littleford Bros.	19
Loper Fire Alarm Co.	—
Luitwieler Pumping Engine Co.	27

M	
Marden, Orth & Hastings Corp.	8

N	
Nat'l Water Main Cleaning Co.	—
New York Continental Jewell Filtration Co., The	35
Northwestern Steel & Iron Wks.	2

O	
Odorless Sewer Basin Co.	39
Otterson Auto-Eductor Co., The	—
Ozone Co. of America	—

P	
Pacific Flush-Tank Co.	39
Parker, A. A.	21
Penn. Salt Co.	—
Permutit Co.	—
Pitometer Co., The	27
Pittsburgh Filter & Engineering Co.	33
Pittsburgh Meter Co.	27
Pollock & Taber	34
Potter, Alexander	34

R	
Republic Creosoting Co.	—
Roberts Filter Mfg. Co.	35
Robertson Co. H. H.	—
Robinson, Geo. L.	34

S	
Sanitation Corporation	35
Smith, A. P. Mfg. Co., The	35
Stacy-Bates Co.	35
Standard Oil Co., of N. J.	40
Standard Oil Co. (N. Y.)	19
Standard Paint Co., The	39
Sterling Eng. Co.	—
Stewart, W. H.	—
Stillman & Van Sicklen	34
Stuebner, G. E	36
Sullivan Machinery Co.	—

T	
Taylor, Henry W	34
Terre Haute Vitrified Brick Co.	19
Texas Co	5
Thomson Meter Co.	33
Thornton Fire Brick Co.	—
Tiffin Wagon Company	—
Training School for Public Service.	—
Truscon Steel Co.	—

U	
Union Water Meter Co.	—
U. S. Asphalt Refining Co.	—
U. S. Rubber Co.	—
Universal Road Machinery Co.	—

W	
Ward, Chas. R., Engineering Corp.	34
Warren Bros. Co.	39
Warren Foundry & Machine Co.	35
Watson Wagon Co.	21
Wells, Jas. P.	34
Willite Road Construction Co., Inc.	7
Wyckoff Pipe & Creosoting Co.	2

Z	
Zeig, F. B., Mfg. Co., The	—
Zelnicker, Walter A., Supply Co.	31

B-E-E-SYSTEM OF
WASTE DISPOSAL

SANITARY—ECONOMICAL—EFFICIENT

CHICAGO INCINERATOR CO.
MONADNOCK BLOCK, CHICAGO, ILL.

THIS
The Sanitary Way
or
the Old
Breeder
OR THIS

ODORLESS
SEWER BASINS
mean better public health and a saving in labor and time in cleaning.
ODORLESS SEWER BASIN CO.
YOUNGSTOWN, OHIO

ASPHALT SEWER PIPE COMPOUND

Waterproof—Acidproof and Root Proof

Resilient at all Temperatures

Specially adapted for use in wet trenches.

Permits top-side jointing of several sections before placing pipes.

Will not crack at low temperatures or run out of joints at high temperatures.

Write for samples and prices

WARREN BROTHERS COMPANY
Engineering Department
BOSTON, MASS.

Pat. No. 965,168

D & D
Safety and Noiseless Cover

WM. E. DEE COMPANY
30 N. LA SALLE STREET, CHICAGO, ILL.
WE MANUFACTURE
Manhole, Catch Basin and Sewerage Castings of all kinds. We make anything in Gray Iron. Write for our prices.

AUTOMATIC
MILLER SIPHONS
SAVE LABOR
FOR FLUSHING SEWERS AND DISPOSAL PLANTS
FREE ILLUSTRATED CATALOGS
PACIFIC FLUSH-TANK CO.
CHICAGO, ILL. NEW YORK

BITUMINOUS JOINTS
Made with SPC PIPE SEAL COMPOUND
are in no way affected by sewage, acids or alkalies and are a perfect protection against the infiltration and penetration of roots.
A full line of Bituminous Compounds, Paints and Preservative Coatings. Booklets on request.
THE STANDARD PAINT COMPANY
NEW YORK BOSTON CHICAGO

CLARK
STANDARDIZATION AFFORDS—EFFICIENCY—ECONOMY—PROTECTION—CONVENIENCE

Large meters are housed in the same manner as the small ones. Uniformity throughout. Fits the lawn, paved street, concrete walk—anywhere. Proven to be RIGHT through use of thirty years. The Clark line of water works materials is extensive. Send for catalogue.

H. W. CLARK CO., 1508 BROADWAY, MATTOON, ILL., U. S. A.
NEW YORK SALT LAKE CITY SAN FRANCISCO CHICAGO

Trade Mark

EAGLE STREET
ENGLEWOOD, N. J.

Bituminous Macadam Roads

Roads constructed by the penetration of hot ASPHALT BINDER into a properly graded stone base produce permanent asphalt pavements.

This form of pavement is known as Bituminous Macadam, and costs very little more than ordinary macadam roads. Such roads can be constructed to meet all conditions of traffic and are suitable for heavy grades as well as level streets.

Standard Asphalt Macadam Binders "B" & "C" are used for Bituminous Macadam and are designed to meet all conditions of climate and traffic.

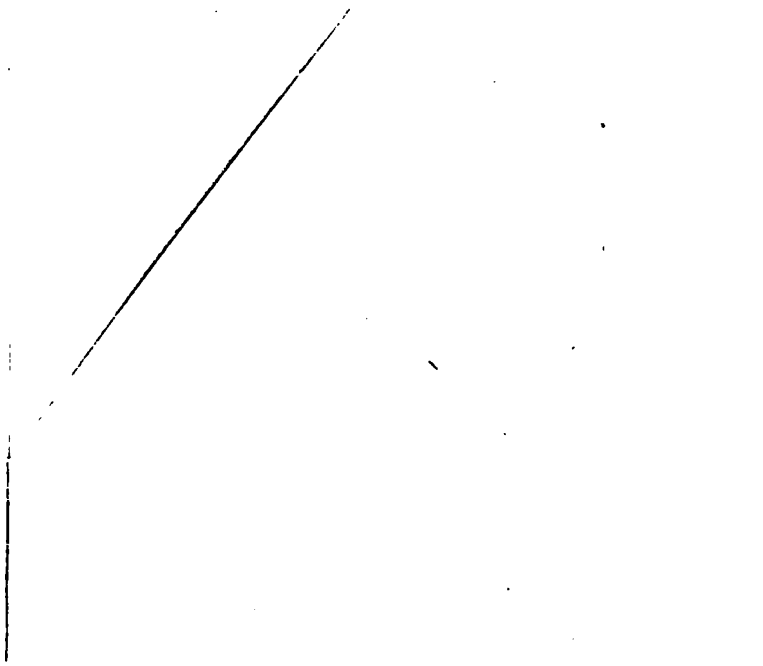
They are PURE asphalts, refined from Mexican asphaltic petroleum to the proper consistency, and have greater cementing strength at all temperatures than any other asphalts.

(Write for specifications and full particulars)

STANDARD OIL COMPANY

(New Jersey)

NEWARK, N. J. BALTIMORE, MD.

GEO. W. LAMSON, Western Representative
Railway Exchange Building, Chicago, Ill.

3 2044 029 514 908